MONTANA STATE COLLEGE LIBRARY
BOZEMAN

This Book is the Property of the Library of the Montana State College of Agriculture and Mechanic Arts.

Call Number ~~595.75~~ ~~[illegible]~~

Accession Number 29523

[redacted]

ONTANA STATE COLLEGE LIBRARY
BOZEMAN

A BIOLOGY OF THE BRITISH HEMIPTERA-HETEROPTERA

A BIOLOGY OF THE BRITISH HEMIPTERA-HETEROPTERA

BY

EDWARD A. BUTLER
B.A., B.Sc., F.E.S.

WITH COLOURED PLATES,
PHOTOGRAPHS AND TEXT FIGURES

LONDON
H. F. & G. WITHERBY
326 HIGH HOLBORN, W.C.
1923

MONTANA
STATE COLLEGE LIBRAR
BOZEMAN, MONTANA

~~595.75~~
~~B9n~~

Manufactured in Great Britain

523
.H6
F23
1923

PREFACE

As this work is intended to supplement and not to supplant that well-known text-book, Saunders' "Hemiptera-Heteroptera of the British Islands," I have refrained from including descriptions of the perfect insects, except of such as have been added to the British List since 1892, the date of publication of that treatise. The excellent descriptions in "Saunders" give, in most cases, all that is needed for identification, but where experience has shown that any of them need some little modification or enlargement, I have endeavoured to make the necessary emendations. My aim has been to gather together into one book all the information that has been amassed by various observers, whether in the British Isles, on the Continent, or in America, about the early stages, the life history, and the habitats, habits, and distribution of our British species. I am, of course, fully conscious of the extent to which the execution of the work falls short of what might be expected from its title; this imperfection is shown by the very frequent occurrence of the word "unknown." But I venture to hope that by calling attention to both what has already been achieved and what still remains to be accomplished, my efforts may be the means of reviving interest in this sub-order, and of stimulating students to undertake such observations as will tend to complete our knowledge of the insects belonging to it. Nature is so wide and so chary of her secrets that it will require the labours of many generations before such an end is fully attained.

Ent. Witherby 1.3.80

A word may be said here about the illustrations. Practically all Heteroptera have an equipment of hairs, above and below, and on antennae and legs. These show great diversity in colour, in size and shape (long and short, straight and curved, thick and thin, fine-pointed and blunt), in number and distribution (many and few, closely packed and scattered, continuous and in patches), and so on. They are of great importance in distinguishing species, but they are very small, and unless the drawings were made on a gigantic scale it would be impossible adequately to show their differences. To prevent misrepresentation, therefore, I decided in most cases to omit them altogether, so that students might rely upon combining their use of the compound microscope with a careful study of the text, in order to complete the picture.

29523

There remains the pleasant duty of offering my warmest thanks to the many entomologists who have most kindly and willingly helped me by the loan or gift of specimens, or by the communication of their unpublished notes, and especially to Messrs. E. C. Bedwell and H. Britten, Prof. J. W. Carr, Messrs. G. C. Champion, E. P. and H. R. P. Collett, J. Collins, F. H. Day, H. Donisthorpe, T. and T. H. Edmonds, J. Edwards, H. Willoughby Ellis, H. F. and J. C. F. Fryer and H. M. Hallett, Dr. J. W. H. Harrison, Messrs. G. E. Hutchinson, J. H. Keys, C. Morley, J. Murray and E. A. Newbery, Prof. E. B. Poulton, Messrs. G. B. Routledge and H. A. Saunders, Dr. Hugh Scott, Commander J. J. Walker, and Mr. O. Whittaker. I also received much assistance from the late Lieut. H. V. Corbett, Mr. W. Evans, and Mr. W. West. To the skilful work of Mr. Hugh Main, B.Sc., I am indebted for the fine series of photographs which are included. The drawings of Coreid eggs in Plate III are from the pen of Miss Bertha Reid, and first appeared in *Ent. Mo. Mag.* xlviii, 38.

E. A. B.

1923.

LIST OF ILLUSTRATIONS

PAGE

Plate I. Nymphs of *Calocoris ochromelas* Gmel., *Pyrrhocoris apterus* L., *Sehirus dubius* Scop., and *Emblethis verbasci* F. . . . *facing* 15
- Tarsi of Heteropterous larvae 15
- Nymph of *Eurygaster maura* L. 22
- „ *Sehirus bicolor* L. 31
- „ *Aelia acuminata* L. 41
- Larvae of *Palomena prasina* L. 52

Plate II. Eggs of *Pentatomidae, Berytus,* and *Nabis ?* . . . *facing* 63
- Nymph of *Picromerus bidens* L. 67
- „ *Troilus luridus* F. 70
- „ *Acanthosoma haemorrhoidale* L. 77
- First instar of ditto 77
- Nymph of *Enoplops scapha* F. 90
- Young larva of *Alydus calcaratus* L. 101
- Head of *Stenocephalus agilis* Scop. 104
- Nymph of *Corizus subrufus* Gmel. 111
- First and last larval instars of *Myrmus miriformis* Fall. . . . 116

Plate III. Eggs of *Myrmus, Chorosoma, Piezodorus,* and *Nepa* . *facing* 121
- Saw-case of *Eremocoris podagricus* F. 135
- Nymph of *Nysius thymi* Wolff 138
- „ *Henestaris laticeps* Curt. 147
- „ *Peritrechus geniculatus* Hahn. 167
- „ *Drymus sylvaticus* F. 180
- „ *Acalypta cervina* Germ. 202
- Egg of *Dictyonota strichnocera* Fieb. 206
- Nymph of *Physatochila quadrimaculata* Wolff 213
- „ *Aneurus laevis* F. 221
- Egg of *Hydrometra stagnorum* L. (after Leuckart) 235
- Intermediate larva of *Velia currens* F. 240
- Egg of *Reduvius personatus* L. (after Leuckart) 262
- Nymph of *Nabis apterus* F. 269
- Profile of young larva of *Nabis lativentris* Boh. 273

Plate IV. Nymphs of *Nabis lativentris* Boh., *Psallus betuleti* Fall., *Camptozygum pinastri* Fall., and *Conostethus roseus* Fall. . *facing* 274
- Egg of *Nabis major* Cost. 276

PAGE
Nymph of *Nabis major* Cost. 276
,, *Salda C-album* Fieb. 295
,, *Salda cocksi* Curt. 302
,, *Ceratocombus coleoptratus* Zett. 305
,, *Anthocoris nemorum* L. 332
,, *Tetraphleps vittata* Fieb. 335
Saw-case and saws of *Capsidae* 348
Egg of *Leptopterna ferrugata* Fall. 370
Nymph of *Pantilius tunicatus* F. 379
Egg of *Pycnopterna striata* L. 407
Nymph of *Lygus pratensis* L. 418
,, *Capsus ruber* L. 440
,, *Rhopalotomus ater* L. 444

PLATE V. Nymphs of *Heterotoma meriopterum* Scop., *Campyloneura virgula* H.S., *Camptobrochis lutescens* Schill., and *Gastrodes ferrugineus* L. . . . . *facing* 462
Egg of *Strongylocoris leucocephalus* L. 465
Nymph of ditto 465
,, *Pilophorus cinnamopterus* Kb. 470
Egg of *Cyllocoris flavonotatus* Boh. 474
Nymph of *Harpocera thoracica* Fall. 508

PLATE VI. Eggs and imago of *Nepa cinerea* L. . . . . *facing* 541
Young larva of *Nepa cinerea* L. 546

PLATE VII. *Ranatra linearis* L. and *Corixa* with *Hydrachnidae* . *facing* 551
Nymph of *Aphelochirus* 554
Palae of ♂ *Corixae* 579
Egg of *Corixa striata* L. 584
Nymph of ditto 585
Palae of ♂ *Corixae* 589

THE BRITISH HEMIPTERA-HETEROPTERA

INTRODUCTION

THE Hemiptera (also called Rhynchota, and popularly " bugs ") constitute one of the least-known orders of the great class Insecta, though it includes such familiar insects as bed-bugs, cicadas, lantern-flies, frog-hoppers, plant-lice, scale-insects, and the true lice. From other insects they are easily distinguished by the two characteristics of a suctorial mouth and an incomplete metamorphosis, or, in other words, they are provided with a kind of beak for extracting the juices of the plants and animals on which they feed, and the young bug issues from the egg in the form, not of a grub, maggot, or caterpillar, but of an active six-legged creature somewhat similar to the adult, into which it is gradually transformed by successive moults, without ever once ceasing to be active and to take food. Thus the life-history is totally unlike that of a butterfly, a bee, a beetle, or a fly, in all of which there is a resting stage called the chrysalis, or pupa. No such stage occurs in these insects.

The order is usually divided into two sub-orders, according to the texture of the upper pair of wings, viz. Heteroptera, in which the upper wings (hemielytra) are usually composed of various parts, of which the basal are stiff and unyielding and the apical membranous and flexible, and Homoptera, in which the upper wings are of more uniform texture. It is only with the former that we are here concerned, and these are popularly known simply as " bugs." As regards the nature of their life history, the Hemiptera find their nearest allies in the order Orthoptera, or locusts, grasshoppers, crickets, stick-insects, cockroaches, and dragon-flies, all of which have equally an incomplete metamorphosis, but these differ from the Hemiptera in having a biting mouth, and so subsisting on solid food.

The British Hemiptera-Heteroptera constitute a mere fragment of the entire Palaearctic Fauna belonging to that sub-order, and comprise mainly those species that are either commonest or most widely distributed in the Palaearctic Province as a whole. Though they have been cut off from direct communication with their fellows of the Continent during all the centuries and millenniums that have elapsed since the sea broke the last links of connexion and formed the Straits of Dover, very little differentiation has taken place between the insular and the continental forms of the same species. It follows, therefore, that if any changes have been produced in the insular Hemiptera by natural causes throughout all those ages, they must, in the main, have been balanced on the Continent by similar changes due to the operation of like causes. Such trifling differences as do exist are to be met with chiefly amongst the *Capsidae*, and the most noteworthy example is that of *Calocoris sexguttatus* ; our specimens are of a form and coloration which, according to Reuter, is not found on the Continent, while the usual continental form does not occur with us. Another example is that of *Camptozygum pinastri*, which, with us, is usually much paler than the continental form, and Dr. Reuter was much struck with this fact on his first visit to Scotland. The black variety of *Stenodema laevigatum*, again, which is rare with us, is not recorded at all from the Continent, though a similar melanic form of a closely allied species, *S. virens*, has occurred there ; and finally the range of variation in most species is usually wider on the Continent than with us.

Six species have been recorded from the British Isles only, viz. *Myrmedobia inconspicua*, *Globiceps ater*, *Conostethus brevis*, *Corixa saundersi*, *C. boldi*, and *C. caledonica* ; but two of these, *Globiceps ater* and *Corixa boldi*, are known by single specimens only, taken very many years ago, and it seems probable that these are not true species, but mere aberrations of some allied forms. The variety *Psallus variabilis*, var. *whitei*, also is recorded from Britain only.

Judging from the analogy of other groups of animals, there can be little doubt that the Hemipterous fauna which peopled the country after the last Glacial Period, and from which our present fauna has been derived, must have been more extensive than the present one, and that many species must have been exterminated.

For an island, Great Britain covers a large area, and the geographical and climatic conditions are exceedingly diversified ; every kind of soil is present, and the vegetable products are almost equally varied ; geologically, it is well known, our island is a kind of epitome of Europe ; hence the conditions are not such as would produce to any marked degree what on a small island is known as an insular fauna. Apart from the few instances quoted above, there is very little to distinguish our British from the continental Hemiptera, and the chief result of the separation of these islands is to be seen in the reduction of the number of species.

Nor does the long-established cultivation of the country seem to have made much difference, and this is only what was to be expected, as the conditions on that part of the Continent nearest us have been similar. Perhaps the most noteworthy example showing the influence of horticulture is that of *Lygus viscicola*, which is almost entirely confined to the orchards of England, where also its food-plant, the mistletoe, has found most favourable circumstances for its preservation and multiplication, and the insect has prospered concurrently. On the Continent it is recorded only from France. Two species of *Capsidae* are even now gradually establishing, or indeed have established themselves in orchards, viz. *Plesiocoris rugicollis* and *Orthotylus marginalis*; the natural food-plants of these insects are various species of *Salix*, and the attack upon orchards indicates a startling change of taste brought about by the temptation of well-nurtured plantations of apple trees in their neighbourhood. Species like *Lygus pabulinus*, *L. pratensis*, and *Calocoris norvegicus* (*bipunctatus*, auctt.) have spread very widely amongst cultivated plants, but then they are equally common everywhere else, and the same thing holds good on the Continent.

Afforestation, especially in the planting of coniferous trees, has brought about an extension of the area of some species, and probably also the introduction of others. Julius Cæsar, in his "Gallic War," describes the S.E. of England in the first century B.C. as destitute of fir trees, though plenty of such trees are to be found in those parts at the present day, and these all have their Hemipterous denizens. That the introduction of such trees very speedily produces an influx of their insect inhabitants was well shown by the late Mr. W. E. Sharp in his "Notes on the Coleoptera of Crowthorne." The clearing of forests, again, must have had an enormous influence on such species as inhabit forest trees, while the growth of towns also has reduced the area inhabitable by these insects, and has even quite recently led to the extermination of local species from certain areas (see especially No. 79).

It is an interesting fact that several of our rarest species have been found only or chiefly in Kent, just at the point where the last connexion with the Continent was severed, as though these species were even in those early days at the extreme limit of their distributional area, or were actually retreating southwards, and therefore, when the severance came about, only a few outposts, so to speak, were left in the island, where they have been able to do no more than maintain a precarious footing ever since.

The British student of the sub-order is, then, handicapped by the comparative poverty of its representation in these islands, as well as by the fact that many species which are quite common on the Continent are exceedingly rare with us. But, on the other hand, with a smaller number of species to study, it should be possible to gain a much fuller knowledge of those that do occur, at least commonly. We ought, therefore, to be able to look to British Hemipterists to do much towards the elucidation of the life histories of those species with which they are concerned. In Oshanin's "Katalog" a little over 3500 species of Palaearctic Heteroptera are recorded, and of this large total we possess only about 470, or less than one-seventh part.

On the other hand, if we reckon only the species that are of general distribution throughout Europe, of 346 of these we have the large proportion of 301. In collecting on the Continent north of the Mediterranean area one is struck by the fact that the species taken usually contain a very large proportion of what we find at home.

The ova of the Heteroptera have been observed in comparatively few instances. So far as known, they are usually more or less of a cylindrical or oval form, with the surface sometimes elaborately sculptured and ornamented with spines and other processes, sometimes deeply sulcate and sometimes quite plain. Some are of a uniform colour, green, yellow, or brown, others banded with different colours. The emerging larva often effects its exit by tilting up a cap from the cephalic end of the egg, using for the purpose an instrument called an egg-opener, but sometimes by the mere longitudinal fission of that end. The micropyles are sometimes very elaborately constructed. Oviposition takes place in spring or in early summer in the case of those species that pass the winter in the adult condition, but apparently nearly 50 per cent of our species must oviposit in the autumn and so endure the inclemency of winter in the egg state. Much, however, yet remains to be discovered as to the exact course of the life history in most cases. In the majority of cases where the eggs are described they were taken from the body of the female by dissection, and therefore the colour given is not necessarily that of the fully matured egg after oviposition.

It has already been pointed out that the Hemiptera undergo what is called an incomplete metamorphosis, or, in other words, the insect is active and feeds throughout life, and no quiescent stage such as the pupa of Lepidoptera intervenes between the larva and the imago. In a large number of cases there are distinguishable five instars during larval life, separated from one another by ecdyses, or moults. In the last of these larval instars the rudiments of the hemielytra and wings are usually very evident, and the name " nymph " has been applied to this instar ; but as these " rudimenta hemelytrorum," or " rudimenta alarum " of Reuter, the " wing-pads " of American Hemipterists, are merely a more advanced stage of structures which are present in differing degrees in the two preceding instars, the term " nymph," as used in this work, is not intended as anything more than a convenient one for occasional use to express the last larval instar. The wing-pads, two pairs in number, are of course attached to the meso- and metanotum, those segments of the thorax that carry the hemielytra and wings of the adult. The first pair overlap the second to some extent, and they generally extend over the sides of the first two or three abdominal segments.

The larva usually differs from the adult in its much softer integument, especially in the abdomen, which has often to be greatly distended when the insect is gorged with food ; and therefore, on drying, the abdomen often shrinks to an unsightly mass, thereby increasing the difficulty of the specific determination of dried specimens. A further difficulty arises from the fact that, accompanying this shrivelling there is also frequently a disappearance of all bright colours, except such as are metallic ; greens, particularly, which are extremely common in the larvae, especially of the *Capsidae*, often become merely dull brown, or even black. Specimens preserved in spirit retain their form and to some extent their colour ; greens are preserved even in dried specimens by the action of formalin, but this tends to alter the quality of the tint. The larvae always have four joints to the antennae, and in this respect they agree with the adult, except in the *Pentatomidae* (British) and the *Hebridae*, in which there are five. The genus *Coranus* (*Reduviidae*) is exceptional in having more than five joints. A four-jointed antenna may therefore be regarded as what Reuter calls a " primitive character." The larvae have also, almost universally, a smaller number of joints in the tarsi than the adult, and they have in British species, so far as my experience goes, no ocelli. But, as one large family, the *Capsidae*, have no ocelli even in the adult stage, the same being true also of the *Pyrrhocoridae* and sometimes of some *Lygaeidae*, this point of difference cannot always be relied upon to separate larvae from adults. Further, the Acanthosomina have the same number of joints in the tarsi in the adult as in the larva, two in each case. Thus it will be seen that more numerous and important changes take place at the last moult than in any of the preceding ones. There is, in most cases, the acquisition of wings and ocelli, the increase of the number of joints in the tarsi, and sometimes in the antennae, the transference of the openings of the scent-glands from the dorsal to the ventral side of the insect, and the full development of the sexual organs. The face of the larva shows the same threefold division as occurs in the adults ; for the central division I have retained the name used by Saunders, " central lobe," and I have spoken of the other two as side lobes. But it should be noted that the central lobe is also called " clypeus " and " tylus," and the side lobes " genae."

Many of the structural features upon which dependence has to be placed in determining the *families* of the adult insects altogether fail when the larval forms are under consideration. For example, we get no aid from the number of either antennal or tarsal joints, for, as already stated, of each of these all the families possess the same number, viz. four antennal and generally two tarsal. Again the presence or absence of ocelli does not help us, as no British larval forms, so far as known, possess ocelli at all. The absence of hemielytra and wings again, which are often useful diagnostics in the adult, adds still further to the difficulty, as the wing-pads do not show any essential differences in the various families, and the same remark holds good with respect to the structure of the pro- and meso-notum.

And yet, as one studies the structure of the larval forms, it becomes evident that, although so many of the salient features of the adult insect are either absent or of no practical use in diagnosis, we are not dealing with a heterogeneous assemblage which defies classification, but that it is possible to find other characters which lead to results identical with those indicated in the classification of the adults. In other words, it is possible to define the families from their larval characters almost as well as from those of the imago. For practical purposes it is scarcely necessary to give such definitions for the few families of water-bugs, for, besides the indication given by the habitat, the larvae are sufficiently like the adults to be easily recognised. But, as regards most of the other families, a tabulation is given later on which, though not lending itself to the usual dichotomous form of an analytical key, will, I believe, be found to be accurate for our British non-aquatic species, so far as the larvae are at present known.

In general, there is not a great deal of difference in appearance between the sexes in the imago; the ♂ is commonly a smaller, more slender and more active insect than his partner, and sometimes has longer antennae. But in the *Capsidae* a few remarkable examples of sexual dimorphism occur, notably *Systellonotus triguttatus*, *Globiceps dispar*, *Mecomma ambulans*, and *Byrsoptera rufifrons*, in which the sexes in their usual form are quite unlike, and the same holds good of the various species of *Microphysa* and *Myrmedobia*. But these profound differences arise in part from the fact that the ♀ in such cases has a very much broadened abdomen, no doubt to accommodate either an unusual abundance of ova or their larger size, and is destitute of anything more than the rudiments of the apparatus of flight.

These examples lead us to the subject of the imperfect development of the alary organs which is so frequently the normal condition in the adult Hemiptera. This is sometimes expressed by saying, in the terminology introduced by Stål, that there are both macropterous (or long-winged) and brachypterous (or short-winged) forms; such a nomenclature, however, very inadequately expresses the true state of affairs; for the abbreviation of the organs of flight may and does exist in very various degrees in different species, and sometimes even in the same, while in a few instances the insects are actually apterous. Various terms, more or less clumsy, were coined by J. Sahlberg and Reuter to express these numerous forms, but they have not found general acceptance. In the British Fauna the *Pentatomidae* contain no instances of any such irregularity, while the *Coreidae* include only one, *Myrmus miriformis;* our single species of *Pyrrhocoridae* with us almost always shows brachyptery in both sexes. In the *Cryptocerata* only one instance occurs in the British Fauna, viz. *Aphelochirus*, and in this the brachypterous not only occurs in both sexes, but is the only form that has yet been met with here. Amongst the *Gerridae* occur the only examples, six in number, of the entirely apterous form; and it is noteworthy that they are all water insects, disporting themselves on the surface of ponds and streams, or on the aquatic vegetation which lies on the surface. The apterous is by far the commonest form in the species in which it exists, but occasional fully-developed examples are met with, and in most cases nothing intermediate between the two is ever seen. Three species of *Gerridae*, however, *Gerris lacustris*, *G. odontogaster*, and *Aepophilus bonnairei* are, the first two often and the other normally merely brachypterous. In the *Cimicina*, brachyptery characterises all examples of both sexes, while in several of the *Anthocorina* both forms appear. In the *Ceratocombina* two of the species, *Ceratocombus* and *Pachycoleus*, are normally brachypterous to some extent, although the hemielytra even then pass beyond the end of the abdomen, while in all the *Microphysina*, as already mentioned, the ♂♂ are always macropterous and the ♀♀ brachypterous. In many species of *Berytidae*, *Lygaeidae*, *Tingidae* (genera *Acalypta* and *Lasiacantha*), *Reduviidae*, and *Saldidae*, both forms exist in each sex, though seldom equally commonly. In the *Capsidae* examples of irregularity are not very numerous, though many varieties of it are known. Where there is the greatest discrepancy between the sexes, it is always the ♀ that suffers the curtailment, but in a few instances both sexes normally undergo more or less reduction, while in those that live in moss, such as the genus *Chlamydatus*, brachyptery is the rule for both sexes.

This abbreviation of the organs of flight exists in very varying degrees. It may be no more than (i) a mere narrowing of the whole hemielytron, as in the *Berytidae*, this modification being known as crypto-dimorphism or stenoptery ; or (ii) merely a slight shortening and rounding of the membrane only, as in *Acalypta*, *Lasiacantha*, *Salda*, *Nabis rugosus*, *Stenodema holsatum*, *Lopus*, and *Teratocoris* ; or (iii) a shortening of the whole hemielytron without the complete suppression of any of its parts, as in *Myrmus*, several species of *Nabis*, *Leptopterna*, *Dicyphus*, and *Globiceps*. But much more frequently (iv) the whole hemielytron is much shortened, with the membrane either disproportionately reduced or absent altogether, as in many of the *Lygaeidae*, and in *Pyrrhocoris*, *Hebrus ruficeps*, *Prostemma*, *Nabis limbatus* and *lineatus*, *Cimex*, a few *Anthocorina*, most of the *Microphysina*, *Pithanus*, *Myrmecoris*, *Bothynotus*, *Allodapus*, *Globiceps dispar* ♀, *Systellonotus* ♀, and *Aphelochirus ;* or (v) it is reduced to a strongly convex scale, as in *Microphysa pselaphiformis* ♀, *Myrmedobia coleoptrata* ♀, *Bryocoris*, *Orthocephalus*, *Halticus*, *Mecomma* ♀, *Brysoptera* ♀, and *Chlamydatus ;* or finally (vi) as already indicated, every trace of both hemielytra and wings disappears. In case (i) the wings suffer a similar narrowing, but in case (ii) they are often fully developed ; in all the other cases they are much abbreviated, being reduced in (iv) and (v) to the merest rudiment, and occasionally, as in *Acalypta*, being absent altogether. In most brachypterous forms there is some modification of the prothorax, obviously because of the imperfect development of the muscles concerned in flight ; for the reduction which this occasions in the mesonotum communicates itself also to the pronotum by which it is overlapped, and this part therefore is narrowed in front. As the abbreviated alary organs are of no more use for flight than if they were still further reduced, or were even absent altogether, the question arises why the abbreviation stops just where it does. The only answer I can suggest is that the short elytra may perhaps supply a certain amount of protection to what appears to be the weakest part of the body, viz. the junction between thorax and abdomen, which they always overlap. In apterous species this junction is much stronger, and does not need such protection.

A still further question naturally arises as to why there should have been any reduction at all; what is the purpose served by these "imperfect perfect insects," as they have sometimes been called? From the opposite point of view it may fairly be maintained that the occasional occurrence of winged forms amongst a species which is usually deprived of the power of flight may be advantageous in assisting the dispersal of the species and in securing cross-breeding, or the commingling of different races; but such advantages could, apparently, have been better secured had all specimens been winged, and hence an adequate reason for the original reduction is hardly to be sought on these lines. By the non-development of flight-organs, and the consequent reduction in the size of the thoracic region, there is, of course, an economy of material which may aid in securing the vigour of the species. Furthermore, most of the species affected habitually live either near to or actually on the ground, and therefore, perhaps, flight may be considered as less essential to their well-being; but, on the other hand, there are other species with similar habits, and often closely related ones, which nevertheless are fully winged. In this connexion *Nabis ferus* and *N. limbatus* furnish an interesting case. These two are certainly not distantly related, but *N. ferus* is always fully winged, while *N. limbatus* is almost always nearly apterous. Yet, as a rule, *N. ferus* keeps nearer the ground than *N. limbatus;* the latter is a most enterprising insect, climbing about in all sorts of places, and making no attempt at hiding itself, whereas *N. ferus* is a shy, retiring creature. From another point of view, however, the enterprise seems to lie on the side of *N. ferus*, for this is found spread over not only the whole of Europe, but also over the north of Africa, the greater part of Asia and a large part of N. America; while *N. limbatus* belongs chiefly to the more northern parts of the Palaearctic Province, though it has also gained a footing in the northern portions of the Nearctic. Probably the winged condition of *N. ferus* may have helped to secure this wider distribution.

Prof. A. Tullgren, of Upsala, has called attention to certain structures which exist in the *Pentatomidae*, *Coreidae*, *Berytidae*, *Lygaeidae*, and *Pyrrhocoridae*, and which he considers as having an auditory function. The organs in question consist of sensory hairs, each of which is set in an alveolus, ringed round at different levels by two chitinous rings; the whole apparatus is called a trichobothrium. Further particulars will be given under the different families.

The plants mentioned in connexion with the different species are those with which the insect has been shown by direct observation to be in some way or other associated, although in some instances the association may have been casual rather than essential; but it by no means follows that they are all to be regarded as food-plants. In many instances they are certainly nothing more than host-plants, used as rest-places, or as hunting grounds by carnivorous species which prey upon the other insect or the arachnid inhabitants of the plants; or, finally, the plant furnishes a nidus for the eggs, even though the insect itself is not vegetarian. This last association is seen in such water-bugs as *Nepa* and *Ranatra*, which lay their eggs in leaves of *Alisma;* amongst the carnivorous *Reduviidae*, too, the late Dr. Chapman found the eggs of *Nabis lativentris* in the stems of *Chlora perfoliata*, and I have eggs of *Coranus subapterus* deposited on *Calluna.* But whatever the association may be, the complete list of plants given in the appendix is highly instructive, as well by its omissions as by its inclusions; the compilation of this list has revealed the fact that to some groups of plants the Heteroptera manifest a strong partiality which contrasts very forcibly with their utter indifference to, or perhaps one should say, their entire avoidance of, others.

Looking at plants as a potential food-supply, we must remember that, as the mouth-organs of the Heteroptera always consist of four fine and sharp-pointed setae, lodged in a trough-like labium, and used as a single piercing organ, the only food that can be taken is of a liquid nature, and must be reached by the penetration of the cuticle of the plant by the cibarial setae of the insect, so as to gain access to the juices that lie beneath. These setae are very flexible, and could hardly, even when combined, be used as a piercing organ, unless strengthened and guided by the more substantial labial trough, which does not itself, however, enter the perforation that is made. It is, therefore, only at its softer parts that the prey, whether animal or vegetable, can be successfully attacked. But as there can scarcely be any British plants that do not present somewhere or other over their surface a cuticle delicate enough to be pierced by the rostrum of even a weak bug, it would seem that the avoidance of certain species of plants cannot be due to any intractability in the material, or, in other words, to any mechanical difficulties involved in getting at the enclosed juices, but must be attributed to some distastefulness in the plants.

Nor does the selection, or the degree of popularity of the plant, appear to be dependent upon the attractiveness of its appearance; in fact, very often the reverse is the case, for plants which are of insignificant aspect, and possess no showy colours, are often very much sought after, to the neglect of more conspicuous species, and in this category come mosses, grasses, and the *Umbelliferae.* The abundance or otherwise of a plant no doubt has some influence on the choice; but even this cannot always be the determining factor; e.g. there are few more abundant plants than the dog's mercury (*Mercurialis perennis*), and yet only on one occasion has a single bug been recorded from this plant. And, again, such common weeds as *Capsella* and *Cardamine pratensis* are entirely neglected.

Few of the existing records made by Hemipterists specify the particular part of the plant on which the bugs occur, whether stems, leaves, flowers, or fruit, though a distinction is commonly drawn between the upper parts and the neighbourhood of the roots. But, in my own experience, when the insect occurs on the upper parts, it is almost always on or under the leaves, except in the case of the *Umbelliferae*, when the flowers are preferred. One species of *Lygaeidae*, *Chilacis typhae*, appears to be found exclusively in the heads of the reed-mace (*Typha*). A few species take up their abode on the trunks of trees, hiding, or perhaps lying in wait for prey, in the crevices of the bark. Spreading plants, which cover some unoccupied space beneath their foliage, provide an attractive shelter to several small species, especially of *Lygaeidae*.

Amongst flowering plants, there are several natural orders that are altogether avoided by our British Heteroptera, and the most noteworthy of these is the *Orchidaceae*. Amongst at least two thousand records which I have been able to collect from entomological literature, and from the unpublished observations of myself and other Hemipterists, I have not found a single one referring to any species belonging to this order. Even as a casual occurrence no connexion between an orchid and a heteropterous bug has been recorded in Britain more than once. In a paper on insect visitors to certain orchids, published in 1917 by Mr. W. Evans in the "Transactions and Proceedings of the Botanical Society of Edinburgh," the author records finding, in August, 1909, one specimen each of *Pithanus maerkeli* and *Lygus lucorum* on a plant of *Listera ovata;* as these two species are gregarious on their regular food-plants, while, in this instance, only one specimen was found in each case, the occurrence is scarcely likely to have been other than casual, and this is the solitary exception to the rule that the whole order of *Orchidaceae* is shunned. The avoidance of these plants is remarkable, for the *Orchidaceae* are fairly numerous in species, upwards of forty being included in the British list, and though some are rare, several are common or even abundant. The other natural orders which are entirely avoided are *Fumariaceae*, *Polygalaceae*, *Frankeniaceae*, *Portulaceae*, *Elatinaceae*, *Linaceae*, *Droseraceae*, *Lythraceae*, *Monotropaceae*, *Apocynaceae*, *Gentianaceae* *Polemoniaceae*, *Orobanchaceae*, *Verbenaceae*, *Thymeleaceae*, *Ceratophyllaceae*, *Hydrocharidaceae*, *Amaryllidaceae*, *Dioscoreaceae*, *Araceae*, *Eriocaulonaceae*. All of these orders have British representatives, though some contain no more than one species; but, on the other hand, the list includes many very well-known and widely distributed plants, such as fumitory, milkwort, flax, loosestrife, periwinkle, gentian, vervain, arum, etc. None of these has any heteropterous inhabitants. Even such plants as the red poppy (Evans) and the red valerian (Bacchus), for which there are one or two records, are probably mere rest- or perhaps host-plants rather than food-plants.

The *Thalamiflorae*, as a whole, are much neglected, for even such extensive orders as the *Ranunculaceae*, *Cruciferae*, and *Caryophyllaceae*, have but very few adherents, and probably most of the records that are given (usually a solitary one in each instance) are merely casual occurrences. The best established connexions in these orders are those of *Eurydema oleraceum* with cabbages, *Beosus maritimus* with *Silene maritima*, *Dicyphus constrictus* and *D. globulifer* with *Lychnis dioica*, and *Orthotylus rubidus* and *Conostethus salinus* with *Arenaria*. The *Tiliaceae* and *Geraniaceae*, however, are more favoured. The lime tree is regularly inhabited by several species, either on its leaves or on its trunk, the most noteworthy being *Lygus cervinus* on the leaves and *Microphysa elegantula* on the trunk, where it probably hunts other small insects. In the *Geraniaceae* the grand attraction is *Erodium*, and the species of *Pentatomidae*, *Coreidae*, and *Lygaeidae* that inhabit sandhills often take shelter under its wide-spreading leaves, if they do not actually feed upon them. *Tilia* and *Erodium* are, in fact, practically the only *Thalamiflorae* that are generally attractive.

The *Calyciflorae* are much more popular, especially the orders *Leguminosae*, *Rosaceae*, and *Umbelliferae*. In the first-mentioned order, *Ulex*, *Sarothamnus*, and *Ononis* are the special favourites. *Piezodorus lituratus*, *Dictyonota strichnocera*, *Asciodema obsoletum*, and various species of *Orthotylus* on *Ulex*, *Dictyonota fuliginosa*, *Anthocoris sarothamni*, various *Orthotyli*, and *Heterocordylus* on *Sarothamnus*, and the genus *Berytus*, *Metacanthus elegans*, *Adelphocoris lineolatus*, and *Macrotylus paykulli* on or under *Ononis*, are the most noteworthy examples of a very intimate association. In the *Rosaceae*, *Crataegus* is the chief favourite, twenty-nine species having been recorded as occurring on it. *Prunus*, *Spiraea*, *Rubus*, *Pyrus*, and *Sorbus* are also attractive, chiefly to various species of *Capsidae*. The broad umbels of the *Umbelliferae* are enticing chiefly to *Capsidae*, but also to several species of *Pentatomidae*, notably *Eurydema dominulus*, but here it is not easy to single out any definite association, as Hemipterists usually do not specify the particular species of *Umbelliferae*, but mention the order as a whole. In the majority of cases, probably the plants referred to are *Angelica sylvestris*, *Heracleum sphondylium*, and *Pastinaca sativa*. Of definite food-plants, the *Onagraceae* furnish two well-known examples, *Epilobium hirsutum* for *Dicyphus epilobii* and *Circaea lutetiana* for *Metatropis rufescens*.

Amongst Gamopetalous plants, the most frequented orders are the *Compositae* and the *Ericaceae*. In the former, *Achillea*, *Tanacetum*, *Artemisia*, *Senecio*, the thistles, and *Centaurea* are the most popular, while in the latter both *Calluna* and *Erica cinerea* have many votaries. The *Rubiaceae* are particularly associated with certain *Capsidae*, especially the genus *Poecilo-*

scytus and its allies. The ash tree is fairly popular, with a record of fifteen species. The *Scrophulariaceae* and *Labiatae* are hardly so attractive as might have been expected. *Verbascum* is by far the most popular in the former order, and in the latter *Thymus serpyllum* and *Stachys sylvatica;* next in popularity to these, but a long way behind them, are *Mentha*, *Origanum*, *Lamium*, and *Teucrium*.

Amongst the *Apetalae*, we find some extremely popular orders, and the *Amentaceae* are the prime favourites. Forest trees, such as birch, alder, hazel, oak, and beech, are all very attractive, and oak easily heads the list with upwards of seventy species. The *Salicaceae*, again, with the various willows and poplars, harbour a great many species. Equally attractive are nettles and the common elm, while the *Chenopodiaceae* and *Euphorbiaceae* also have many associates.

Of Monocotyledons, it has already been pointed out that one of the most showy orders, the *Orchidaceae*, is altogether neglected, and the preference is given to those that possess no bright colours, such as the *Juncaceae* and the *Graminaceae*. These two orders, and especially the latter, are very much sought after, and grasses alone serve as support, in one way or other, to upwards of one hundred species.

The *Pinaceae*, again, are very productive, and juniper, Scotch fir, spruce and larch have numerous adherents; not only are they the food-plants of many species, but also, as evergreens, they often furnish a winter residence to such species as survive that season in the adult form, since they afford much better protection from the weather than the then leafless deciduous trees. Reuter (19) has recorded 190 species of Palaearctic Heteroptera as having occurred on coniferous trees, and of these 101 are inhabitants of Britain. These he classifies into three groups, according as (i) they depend upon deciduous trees or low plants for their food and resort to the *Coniferae* only for hibernation, or (ii) are found on both conifers and deciduous trees or low plants even in summer-time, or (iii) occur exclusively on coniferous trees.

Coming, finally, to the Cryptogamia, we find that ferns give support to a few species, amongst which may be specially mentioned *Monalocoris* and *Bryocoris*, our two solitary representatives of a section of the *Capsidae* which has many remarkable exponents in the Tropics. Foliaceous lichens and lichen-infested trees are attractive to a few, while mosses are extremely popular, especially amongst the smaller species, notably in the *Tingididae* and the smaller *Lygaeidae;* and also as a winter-resort for many of the larger species. The *Capsidae* almost entirely avoid this group of plants, which would, no doubt, be too moist for insects of such a delicate texture.

The habits of those species that are found in the British Islands do not always quite agree with what is recorded of them by continental observers. Thus the Coreid bug, *Gonocerus acuteangulatus* with us, in the perfect state, is confined to box trees, whereas on the Continent it has been recorded from oaks and *Rosa canina*, and the larva from *Rhamnus frangula*. Mr. E. C. Bedwell has found the latter also on yew, where it was attracted by the berries which it was seen to be sucking. One may say, in general, that there are but few species that are confined to a single species of plant. (Butler, 49.)

It may here be remarked that in the list of plants given in the Appendix, those that are not British are printed in italics, while those that are known with us only in a cultivated condition are marked with an asterisk. And further, as Hemipterists, in the record of their observations, frequently give simply the generic names of the plants, or even merely general English names, such as grasses, mosses, etc., it has been found necessary to make separate entries for such names as these, when the exact species of plant could not be determined.

A word may be said here as to the *modus operandi* of feeding, which has been most clearly demonstrated by the researches of Mr. J. C. Kershaw. The maxillary setae are grooved on their inner side, and when placed together fit so accurately as to form a closed tube ; this is protected by the close apposition of the mandibular setae outside them, and the whole four thus form a well-guarded and airtight tube ; at the part just opposite the entrance to the pharynx, or the mouth as it may be called, this separates into its constituent parts which pass on either side to their points of attachment to the inner surface of the front wall of the head. When the combined setae are plunged into the object of attack, the soft anterior wall of the pharynx is raised by appropriate muscles so as to tend to create a vacuum, and then the atmospheric pressure, as usual in so-called " suction," aided in this case by the capillarity of the setal tube, forces the liquid up the tube till it reaches the entrance of the pharynx, where it leaves the tube, is received into the pharynx, and so swallowed. The labial trough takes no part in the process save to guide and steady the combined setae. The species chiefly experimented upon was the Homopteron, *Philaenus spumarius*, the cuckoo-spit, but the rostrum of the Heteroptera, though much longer, is constructed on the same principle.

In dealing with distribution, I have adopted, in most instances, the county system, giving the exact localities only in the case of the rarer species. This method has the advantage of giving a clearer idea of the distribution of each separate species throughout our area than would be indicated by the enumeration of a number of isolated localities, which are often the names of remote parishes, very little known to the public generally, and often requiring, if the county is not mentioned, the consultation of a very full and accurate gazetteer to determine the positions. I have not made a separate county of the London area, as the records are few, but have included its parts in the adjacent counties of Middlesex, Essex, Surrey or Kent.

For the localities, additional to those contained in the standard works of Douglas and Scott and E. Saunders, I have consulted the lists given in the

Victoria Histories of the Counties of England for the following counties: Berks, Bucks, Cornwall, Cumberland, Derby, Devon, Essex, Hants, Kent, Lancs, Leicester, Notts, Rutland, Somerset, Staffs, Surrey, Sussex, and Warwick; the list compiled by Mr. Edward Meyrick and published by the Marlborough College Natural History Society for Wilts; also the lists published by J. E. Mason for Lincs, the Isle of Man, and the Scilly Islands; T. J. Bold for Northumberland and Durham; Dale for Glanvilles Wotton (Dorset); J. Edwards for Norfolk; C. Morley for Suffolk; Whittaker for Lancs and Cheshire; Prof. Carr for Notts; F. H. Day for Cumberland; H. M. Hallett for Glamorgan; W. J. Fordham for Yorks; and myself for Carmarthenshire and the Isle of Wight (the latter in Morey's "Guide.") I have also received much information from Dr. J. Harrison as to Durham and N. Yorks, Messrs. J. Murray and G. B. Routledge as to Cumberland, T. Edmonds and G. C. Champion as to Devon, Commander Walker and Mr. J. Collins for Oxfordshire, and Mr. J. Edwards for Gloucestershire. Many other records have been furnished by my own collecting in Herefordshire, N.E. Yorks, the New Forest, Wilts, Dorset, Cornwall, Carnarvon, Bucks, Herts, Oxon, Epping Forest, Middlesex, and Kent. Many localities have been obtained also from the Power Collection in the British Museum and the Blatch Collection, now in the possession of Mr. Willoughby Ellis. For Scotland I have used the lists given by G. Norman and W. Macgregor; for Ireland those by the Rev. W. F. Johnson and Mr. Halbert. In addition to these, great use has been made of the many scattered notices in the "Entomologists' Monthly Magazine" and the "Proceedings of the South London Entomological Society."

There are still a few counties for which scarcely any records exist, viz. Westmorland, Salop, Rutland, Hunts, Beds, Northants, and Monmouth, and for Wales—Anglesea, Denbigh, Flint, Cardigan, and Montgomery. For Scotland and Ireland the records are so few that it was thought hardly worth while to tabulate them in counties. It will be found that many of our rarer species are almost or entirely confined to the country south of the Thames. It is to be remembered also that the valley of the Thames was the southern limit of the glaciers in the last Glacial Period, and one can hardly fail to associate these two facts together, and to see in them the possibility of cause and effect.

As regards nomenclature, I have adopted in general that of the latest British Catalogue (1908). But, as that does not in all respects coincide with the general Palaearctic Catalogue (Oshanin's) which is used on the Continent and elsewhere, and would therefore put a difficulty in the way of students who wish to extend their studies beyond the limit of our shores, I have indicated in all instances the changes that would be necessary to bring the two into accord.

In the coloured plates and in the line drawings incorporated in the text, in order to avoid over-emphasis, pubescence has been omitted except in a very few instances where it is specially strong and marked.

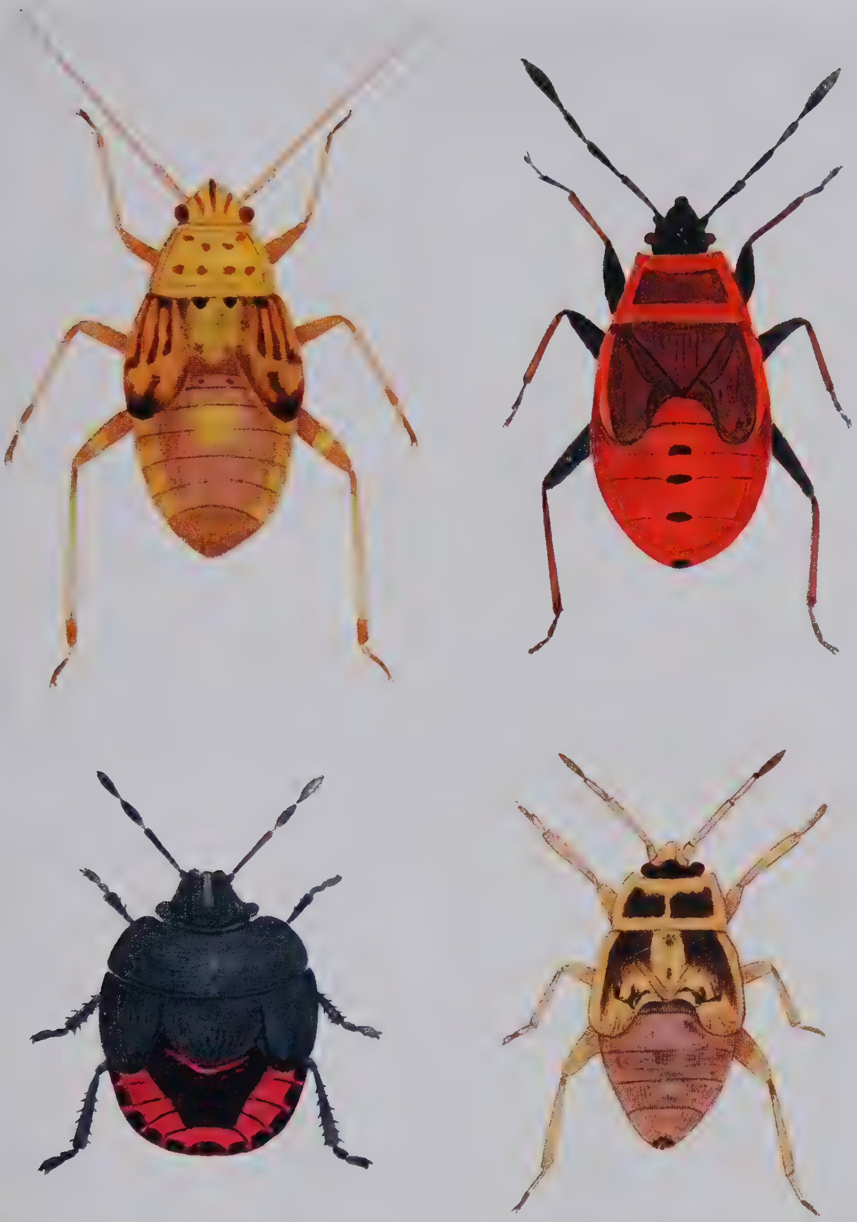


PLATE I.

NYMPHS OF HEMIPTERA-HETEROPTERA.

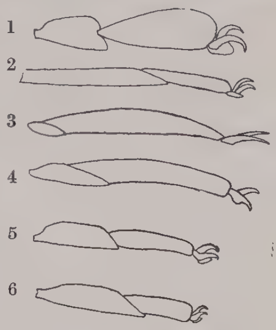
1. Calocoris ochromelas Gmel. × 10.
2. Pyrrhocoris apterus L. × 7.
3. Sehirus dubius Scop. × 9.
4. Emblethis verbasci F. × 10.

E. A. Butler del.

TABLE TO AID DETERMINATION OF FAMILIES IN LARVAL FORMS OF NON-AQUATIC HETEROPTERA

(The larvae of the *Aradidae* and *Pyrrhocoris* are sufficiently like the adults to be easily recognised, and those of the *Microphysina* are almost entirely unknown.)

Pentatomidae. Body short and broad, nearly circular when quite young, more or less punctured; tarsal joints stout, cylindrical, basal shorter than apical; antennae and legs rather robust.



Tarsi of Larvae of Hemiptera-Heteroptera.

1. Palomena prasina (*Pentatomidae*)
2. Aphanus pini (*Lygaeidae*)
3. Nabis apterus (*Reduviidae*)
4. Pycnopterna striata (*Capsidae*)
5. Stenodema laevigatum (*Capsidae*)
6. Peritrechus geniculatus (*Lygaeidae*)

Coreidae. Body longer than broad, often spinous; antennae long and robust, or very robust; tarsal joints variable.

Berytidae. Body elongate; antennae long, very slender, clavate; legs long and very slender; tarsi very short.

Lygaeidae. Body longer than broad; pronotum more or less distinctly bordered at sides, or transversely impressed; antennae of moderate length, rather stout.

Tingididae. Body short ovate, more or less spinous; antennae short, third joint the longest.

Reduviidae. Body much longer than broad; antennae filiform, except first joint; basal joint of tarsi extremely short, apical very long.

Saldidae. Body broad oval; eyes very large; tarsi as in *Reduviidae.*

Cimicidae. Tarsi as in *Reduviidae;* last two joints of antennae filiform except in most *Anthocorina.*

Anthocorina. Integument shining; antennae generally of nearly uniform thickness throughout; rostrum free.

Capsidae. Integument more or less soft and delicate throughout, and not punctured; colours generally bright, but never metallic or lustrous; antennae generally more or less slender and rather long; basal tarsal joint short above, much longer beneath.

SECTION I. GYMNOCERATA

Family I. **PENTATOMIDAE**

The *Pentatomidae* are so called from their five-jointed antennae, and the characteristic holds good for all the British species, although, when exotics are taken into account, the name is not quite so appropriate, as a few of these have but four joints. The thirty-eight British species included in this family, which are less than $\frac{1}{16}$ part of the whole of the Palaearctic species, exhibit great variety in their bionomics. Both phytophagous and carnivorous species are found, and they live on trees, shrubs, flowers, and grasses, as well as on the ground at the roots of low plants. As they are amongst the largest, most conspicuous, and most stoutly built species in the sub-order, it is not surprising that more is known of their biology than of that of several other families. Notwithstanding this, however, the gaps in our knowledge are still very great, and even these few British species afford abundant scope for further investigation. It is not too much to say that scarcely a single life-history can be regarded as completely worked out, and in some cases the early stages are quite unknown.

Amyot and Serville have the following remarks on oviposition in this family. " La femelle prête à pondre se pose sur une feuille, et laisse tomber ses oeufs un à un, en les disposant d'une manière symétrique sur plusieurs rangées transversales. Ces oeufs, au nombre de vingt et plus, sont fixés par une de leurs extrémités, à l'aide du gluten qui les enveloppe ; leur forme, variable selon les espèces, est, en général, ovalaire ou cylindrique, avec les deux bouts aplatis. Ils sont lisses, de couleur diverse, le plus ordinairement blanchâtres, tantôt velus, tantôt épineux ou ornés de dessins à réseaux. Leur extrémité libre est fermée par un petit opercule en forme de calotte, et presque toujours d'une sorte de bourrelet, soit continu, soit composé de petits tubercules. Quand la larve veut en sortir, elle n'a qu'à soulever cet opercule, qui reste attaché, comme par une charnière, au corps de l'oeuf." I am informed, however, by Mr. F. Muir that in those species which are provided with an " egg-opener," this instrument actually *cuts* through the chorion, and does not always cut it quite accurately along the line of the so-called cap.

To this may be added the following from Leuckart :—" The eggs agree in combining a short, stout, and occasionally almost globular shape, and considerable size, with the possession of a lid, the border of which is surrounded by a larger or smaller number of slender, elongated, cup-shaped micropyles. The differences in the shape of the egg are, on the whole, only slight. They are restricted to the form of the micropyle, and the sculpture of the chorion, which is distinguished also by considerable thickness (·12 to ·19 mm.)."

Five larval instars exist in all species whose history has been traced. The larvae are often very unlike the adults, and in fact the mere absence of hemielytra, which form so large a part of the surface of the adult, and carry so much of its ornamentation, would in itself be sufficient to cause great dissimilarity. The larvae differ also in having but four joints to the antennae, and two to the tarsi, and in being destitute of ocelli (in British species); the openings of the scent-glands are on the dorsal surface of the abdomen, instead of the ventral, as in the adult.

The odour of these insects, when in a concentrated condition, is inimical to other insects, to invertebrates of other classes, and even to small vertebrates. Blow-flies, weevils, and small toads were killed by being inserted in phials containing several strong-smelling bugs (Conradi). Notwithstanding this, however, the same bugs have been eaten by full-grown toads, though plenty of palatable insects were about.

According to Tullgren, the auditory organs, or trichobothria, of the adult consist of a pair of sensitive hairs, just behind the stigmata in segments 2, 3, 4, 5, 6 of the abdomen.

Sub-family I. **Scutellerina.**

This sub-family is of world-wide distribution, and is splendidly represented in the tropics, where it contains some of the most brilliant of all the Heteroptera. The Palaearctic contribution consists of about eighty-four species, and of these we in Britain have but four, which are all of sober, not to say dingy coloration. They are well protected by the enormously developed scutellum, which covers the greater part of the body, without, however, being attached to it except where it originates in the mesonotum. Under the scutellum there is therefore a space in which are more or less hidden away the hemielytra and wings. As our representatives of the group live mostly on the ground, it would seem that there can be but few opportunities for the use of the organs of flight. And yet these must be sufficiently numerous to prevent any tendency to atrophy, which would surely result from lack of use; of this they show no trace. The great development of the scutellum appears only in the adult. The first two veins of the wings are separated from one another and enclose a rather broad space, in which there is often a "hamus" or hook.

Montrouzier has recorded instances amongst bugs of this group inhabiting Oceania, of maternal care for the eggs and young. "Many deposit their eggs on the under surface of leaves out of reach of the rain, covering them with their body, and when they are hatched, leading their young ones, and looking after them till they have acquired their wings. Their numerous family is seen following them along the trees, and crowding close to them at the least danger."

1. Odontoscelis fuliginosa L.

Lin., S.N. i. 716, 8 (1767); D. & S., B.H., 60 (1865); Saund., H.H.B.I., 15 (1892).

Ova. I have one specimen of what may possibly be the ovum of this species; it is narrow, fusiform, dark piceous, almost black, and without adornment; length $\frac{3}{4}$ mm.

Larvae. An intermediate instar, the third or fourth: length, slightly under 3 mm. Shape similar to that of adult; brown, marked with black and ochreous; head pitchy; the black markings are sutures of central lobe of head, vertex, two triangular transverse patches on pronotum, two at base of mesonotum and also of metanotum, and the hinder margins of the abdominal scent-glands; the ochreous ones consist of two spots on mesonotum, just internal to the black patches, an indistinct fascia running on each side from base of metanotum to about middle of abdomen, and the area of the abdominal scent-glands, just in front of the black lines; the whole surface closely punctured with brown punctures, and strongly pilose, the hairs being shorter than in *O. dorsalis;* rudimentary scutellum forming a large triangle, rounded at apex; a very slight indication of wing-pads; tibiae strongly spined, spines stronger than in *O. dorsalis;* legs and antennae pitchy brown.

Life-cycle. Luff (3) records immature specimens as not uncommon on the sandhills in Alderney in June, and I have found quite young examples in Jersey in April. The imago is taken from May to September. It therefore appears to mature in the summer, but there is little to show the exact course of its life-cycle.

Habitat, etc. In this country *O. fuliginosa* is confined to sandy places, and is mainly a coast insect. Its chief locality is the sandhills at Deal, where, notwithstanding that these have been "improved" in the interests of golf, it is still to be found amongst the moss on the hillocks. Curtis speaks of having swept it off short grass and *Hedypnois.* Fieber speaks of its occurring on the Continent in dry stony places, at the roots of plants, and under *Medicago lupulina.* It is also recorded from *Olea europaea* and *Erodium circutarium.* André says that he has found it in the nests of the little ant *Tetramorium caespitum,* but no suggestion is given as to the nature of its association with the ants. On the Continent it is not distinctively a coast species, but is found in sandy places inland as well as littoral ones. It is interesting to note that we have in this insect an example of the association of strongly setose tibiae with a sandy soil.

Through the kindness of Mr. E. C. Bedwell I was able in July, 1912, to keep for a time under observation a few living specimens from Deal. I found that the ♂♂ had on each side of the venter a conspicuous patch of yellowish-white substance, probably a waxy secretion. On removing it, the surface of the abdomen on which it rested was seen to be dull and shagreened, though still pubescent like the rest. The pubescence on this area is in rows of golden hairs, scanty and rather stout. I have not been able to find any reference in the literature of the Hemiptera to this secretion, although the shagreened spots are mentioned by Douglas and Scott (1) in the following terms : " In the ♂, on the 4th and 5th [segments], on each side of the middle, two, conjoined, transverse, large, oval, dull spots with transverse lines of golden hairs." The questions which naturally suggest themselves are : " Is the dull spot a perforated patch through which the secretion exudes, or merely a roughened surface to retain it ? Do the hairs help to hold the mass of wax ? If it is not an exudation, how is it placed there ? and, finally, what is its purpose ? " I cannot at present throw any light upon any of these subjects.

Distribution. *O. fuliginosa* is distributed throughout the greater part of the Palaearctic Province. In Britain it has been recorded from five counties only, Norfolk, Suffolk, Kent, Cheshire, and the Isle of Wight. Curtis records it from Burnham in Norfolk, and from Lowestoft ; Morley (4) from Felixstowe ; Commander Walker from Great Yarmouth ; Champion from Sandown, I. of W. ; and W. E. Sharp one specimen from Wallasey, Cheshire. Thus it will be seen that no inland localities are given for this species, and in this its insular differs from its continental distribution.

2. **O. dorsalis** Fabr.

Fab., S.R. 139 (1803) ; E.M.M. xlv. 253 (1909).

O. dorsalis closely resembles *O. fuliginosa* in appearance, and the chief points of difference are that it is smaller, measuring only 4 mm. in length, that it has a number of bands of silvery hairs on the *upper* surface (not the *under*, as mentioned in Saunders' " Hem.-Het. Br. Is.," p. 14) which are quite absent from *fuliginosa*, that its dark hairs are longer, and that the two dark streaks on the scutellum are more curved.

Ova. I have found amongst some adults an extremely minute object of the same shape as the supposed ovum of *O. fuliginosa*, but much smaller ; but it seems to be too small for the egg of an insect which is not very much smaller than the preceding.

Larvae. Some years ago Mr. C. Morley (4) submitted to me a number of small larvae he had found on the Foxhall plateau near Ipswich, which I am now inclined to refer to this species, though when I first saw them I not unnaturally referred them to *O. fuliginosa*, as *O. dorsalis* was not then known to be a British insect. The youngest of these larvae measured 1¾ mm. It was oval, covered with long ochreous hairs ; fore parts brown ; abdomen dark ochreous, with large black punctures ; each segment at the lateral margin with a brown more or less quadrate spot ; scutellum with two indistinct dark ochreous longitudinal fasciae ; centre of basal abdominal segments brown, the whole making a scutelliform patch ; openings of scent-glands on the apex of this patch, dark ochreous, not prominent ; head rounded in front and running out into a sharp lateral spine on each side in front of the eyes ; pronotum very transverse, scutellum large ; first three abdominal segments much abbreviated in the centre ; legs brown, tibiae with a few setae outwardly ; tarsi two-jointed, basal joint very small, second large, sausage-shaped.

I have found larvae somewhat larger than above ($2\frac{1}{2}$–$2\frac{7}{8}$ mm.) on the Camber sandhills, near Rye, Sussex. These were undoubtedly *O. dorsalis*, as remains of the adults were with them, sufficient to determine the species, and Mr. E. C. Bedwell has since taken living adults on the same spot. The larvae were similar to the above, but with the legs more strongly setose. I received some still larger larvae from Mr. E. C. Bedwell ; these measured $3\frac{1}{2}$ mm. and were apparently in their last larval instar. The following is a description of them. Broad oval, almost parallel-sided ; similar to preceding instars, but with wing-pads present, though scarcely raised above the general surface ; fore parts, including scutellum and wing-pads more or less dull black, rather closely and finely punctured, the punctures more or less concealed by the rough pubescence ; pronotum in the middle with two broad, rather indistinct, longitudinal lines dark ochreous ; scutellum with four such lines, the two central ones longer than the others ; abdominal scent-glands distinct, pale ochreous ; underside, fore parts black ; abdominal segments of a delicate pink with large black punctures ; a broad black band all round the margin of the abdomen, cut up into trapezoidal blocks by the pale junctions of the segments ; a shining pitchy disc at the anterior margin of each of the 4th and 5th abdominal segments ; terminal segment black ; legs and antennae pitchy black, tibiae strongly setose ; tarsi as before ; underside entirely devoid of pubescence.

Life-cycle. The young larvae found by Mr. Morley (4) were taken early in August, and it seems likely that they would have matured in about a month's time. But I have found larvae in early instars in March, completely covered up in moss ; these would probably mature by the end of May at the latest, and Mr. Bedwell has found the imago in June. If the above conjectures are correct, the species would apparently be double-brooded, and the life-cycle would be as follows : the August larvae would mature in the autumn, pairing would then take place and eggs would be laid, which would hatch before winter ; the young larvae would pass the winter in retirement, as, e.g. in moss, to mature at the following midsummer ; these would then pair, and eggs would be laid which would produce the August larvae. The only alternative to this seems to be for the August larvae to remain till the following spring without any growth, producing imagines only in June; but a long period of six months' inactivity, unaccompanied by any growth, seems very unlikely. The imago has been found in June, July, and August.

Habitat, etc. In habits it no doubt resembles the preceding. On the Continent it occurs more commonly as a coast than as an inland insect (Puton), but with us the contrary seems to be the case, although little can be said under this head, as the insect has hitherto been taken in so few places. Mr. Bedwell's examples were found in a sandy spot under *Erodium*, and mine in moss.

Distribution. This insect is apparently not quite so widely distributed as the preceding. It occurs throughout Central and Southern Europe and on the northern shores of Africa; it passes into Asia through Asia Minor as far as Turkestan. It has not long been known as a British insect, having been introduced into the British list in 1909 by Mr. E. C. Bedwell, on the strength of the specimens taken by him in the Lowestoft district, though at some distance from the coast; I have seen a specimen also from Tuddenham, Suffolk; Mr. Champion has a specimen from Sandown, I.W.; and in the "Power" Collection in the British Museum there is a specimen labelled "Weybridge." I took it in 1913 on the Camber sandhills, near Rye, Sussex, and Mr. T. Edmonds has taken it in Devonshire. This is all that is known at present of the British distribution.

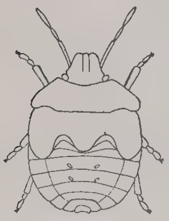
3. **Eurygaster maura** L.

Lin., F.S. 246, 913 (1761); D. & S., B.H. 65 (1865); Saund., H.H.B.I. 16 (1892).

Ova. Globular, glabrous, arranged in rows touching one another. Emerald green in colour when in the ovaries or when freshly laid. They open by a lid something like a priest's cap, and around the junction of this with the body of the egg is a row of little white points (Dufour, 1).

Larvae. When first disclosed from the egg, the larva is dark bronzy-black in colour (Dufour). In the successive instars it gradually becomes lighter, and when fully grown it has very much the colour and shape of the imago. The smallest larva I have seen measures 3¼ mm. The following is a description of it: Short and broad oval; head and thorax entirely bronze; abdomen dark brown, becoming bronze in the region of the scent-glands; connexivum forming an almost continuous fuscous band; legs black; antennae black, becoming brownish at the junctions of their segments; head much larger and broader in proportion to the body than in the adult, and the same is true of the central lobe of the face; mesonotum only slightly longer in centre than at sides; lateral margins of pronotum very finely serrate; in the larvae in all instars the surface is deeply punctured, and the punctures are connected with one another by a network of scratches, which emanate from each puncture as a centre.

Later instar (probably the next) 4¼ mm. Pronotum broader than before, thus giving the insect a more quadrate shape; whole insect fuscous, variegated with brown, and with traces of pale brown spots at the basal angles of scutellum, and a pale central line at its apex; mesonotum longer in centre than at sides; first traces of wing-pads. The next larva I have measures 5 mm., and is in all respects similar to the preceding, but paler in colour. It probably represents the same instar at a later stage. The next measures 7 mm. and is doubtless the last larval instar. It is similar to the preceding, but with a larger proportion of the paler colour, the pale central line of the scutellum and the two small callosities at its base are more distinct, and the scent-glands stand out prominently; the connexivum, moreover, is distinctly marked off, and the wing-pads are larger, descending farther down the body than the scutellum. A nymph which I took at Fleet, Hants, was paler than this; it was ochraceous and very thickly covered with black puncturation. It matured in a few days without taking any food, and yielded a unicolorous dark reddish brown specimen with the carina down the scutellum paler, and thus more distinct than usual. In the ecdysis the skin splits along the middle line of the pronotal and scutellar tergites, and the insect gradually extricates itself through this opening, the covering of the head separating itself from the hinder parts along the line of junction of head and pronotum, but not splitting along the middle, so that it appears in the cast skin as a kind of helmet. This is the usual method of ecdysis in the Heteroptera of whatever family. The cast skin of *E. maura* retains the black puncturation in all its intensity, but the rest of the coloration almost entirely disappears, being situated at a deeper level, and this of course makes the black punctures more pronounced. From this it would appear that the black pigment which lines the punctures has a different origin from the brownish pigment which produces the general coloration, the former belonging to the most superficial layer of the integument, and the latter lying deeper. In the nymph, the scutellum, though large, yet does not attain the abnormal dimensions which it has in the adult. The great scutellar development, therefore, which is characteristic of the Scutellerina, is attained only at the last moult, and is synchronous with the full development of the organs of flight.



Nymph of *Eurygaster maura* L.

Life-cycle. The insect matures in August, when some larvae may still be found, and it hibernates in the imago condition, for Hall records taking it in sandy moss on the Dover cliffs in spring, and Morley by sweeping in a swamp in the New Forest in May, while Bedwell has taken it in June, July, and August, and Dale in June and October. A comparison of these dates seems to imply that the hibernated specimens live on almost until the next generation has matured. Nothing is known of the time of oviposition.

Habitat, etc. *E. maura* is usually obtained by sweeping, especially where the vegetation is luxuriant in woods, amongst tall flowers and long grasses. When in the net it feigns death. If gently handled it exhales no odour, and even if it is irritated or wounded only a slight smell is perceptible (Dufour). It is a most variable insect as regards both colour and size, and many of the varieties have received names. Scopoli remarks, however, that in all the varieties the colouring of the insect beneath is always the same. There is also some variation in shape. While the majority of specimens are nearly parallel-sided, some that I took at Trebarwith, Cornwall, were not merely larger than usual, but also broader across the abdomen, with the sides curving outwards and producing a sinuous outline.

It does not appear to be associated with any particular plant, and has in fact been found on a great variety of vegetation. E. C. Rye took it by sweeping grassy ditches on the hill slopes behind Folkestone, and Hall by sweeping Knapweed in August. It has also been found on the following plants : *Carex, Mentha, Epilobium angustifolium, Secale, Salix* (Kirkaldy). Reuter (5) gives *Eriophorum angustifolium.* Fieber says it is found on stony, grassy hills under various plants, especially *Erica* and *Juniperus*, and on the borders of fields and in meadows. But it occurs in marshy places as well. Flor gives "on the borders of marshes," and Keys took sixteen examples in a bog on Dartmoor, where they appeared to be attached to *Hypericum elodes.* Several immature specimens, put into a jar with that plant and some bog moss, became fully developed in about a week. He never saw them feed, however, nor could he detect any damage done to the plant by the bugs, and his conclusion was that perhaps they might have thriven equally well on any other plants from the same bog. It is here assumed that the insect is a vegetable feeder, but the only direct evidence I can find in this direction is a statement of Dufour's that they are found in France on the young ears of wheat, which they pierce while the ears are still in a green state. I have also swept this species amongst tall marshy plants in a marsh at Trebarwith, but the examples, as mentioned above, were considerably larger than those ordinarily met with in drier places, as well as differently shaped. Linnell found the species under stones in June, and Guérin and Péneau say that it occurs commonly under bark in winter. I have found it amongst *Hypericum hirsutum* in August.

It is subject to the attacks of a few parasites, viz. a species of *Phasia* amongst the Diptera, and *Telenomus sokolovi* and *T. semistriatus* amongst the Hymenoptera (Kirkaldy).

Its anatomy is treated in some detail by Dufour (1).

Distribution. *E. maura* occurs throughout the Palaearctic region and in India and Southern China. In Britain it is recorded from all the coast counties from Essex round to Cornwall, together with Glo'ster, Oxon, Surrey, Cambs, and Glamorgan. Curtis speaks of a specimen found in a garden in Islington, London. It is recorded also from Ireland, but not from Scotland. It is therefore with us strictly a southern species, although on the Continent it extends to 62° 40′ N. Its absence from East Anglia is noteworthy, especially as Norfolk and Suffolk have been well worked for Hemiptera.

4. **E. nigrocucullata** Goeze. (E. austriacus Schrk. var frischii Goeze. Osh. Cat.)

Goeze, E.B. ii. 235 (1778); D. & S., B.H. 66 (hottentottus, 1865); Saund., H.H.B.I. (nigra, 1892).

Ova and **Larvae.** The ova and larvae of this species are, so far as I know, undescribed, but they are probably similar to those of the preceding.

Life-cycle. The imago has occurred on the Continent in all the months from April to October inclusive.

Habitat, etc. This insect is so rare with us that British entomologists have had very few opportunities of becoming acquainted with it in the field. Douglas found a specimen just the colour of the sand amongst the roots of grasses growing thickly under and among the procumbent branches of dwarf sallows on the sandhills at Deal and of the shrubs of *Hippophaë rhamnoides* that then grew upon the tops of the hillocks. It has been found under *Erodium cicutarium*, and Kirkaldy gives *Carduus* as a " food-plant," and Dalla Torre nettles. It is so much like *E. maura* that its habits may be expected to be similar.

Distribution. It is a more southern insect than the preceding, and that will account for its rarity with us. It is found in Europe, except the more northern parts, and on the north coast of Africa, where it is quite common. In Britain its chief resort is the sandhills at Deal, and even here only occasional specimens have been found; the latest record is one by Mr. C. G. Hall in September, 1885. It has also been found at Margate, and the Power Collection in the British Museum contains one from Folkestone. In Whittaker's preliminary list for Lancashire and Cheshire a larva is recorded as having been taken at Birkdale by Mr. Sopp in 1905, by whom it is said to have been passed on to Mr. W. E. Sharp. Mr. Sharp, however, had no recollection of the circumstances, and at any rate the specimen is not now to be found. It seems doubtful whether enough is known of the differences between the larvae of this species and *E. maura* to be certain about their identification. In the adult the insects are readily distinguished by the fact that in *E. nigrocucullata* the central lobe of the face is completely enclosed by the other two, while in *E. maura* it is merely bounded by them at the sides; but whether such a condition holds good for the larvae I cannot say. Lancashire also seems too far north for this strictly southern species. Apart from this record, therefore, *E. nigrocucullata* is confined to Kent. As this county was presumably the last part of our islands to retain connexion with the Continent it is perhaps not surprising that it should be a place so renowned for entomological treasures.

Sub-family II. **Graphosomatina.**

This sub-family contains insects very much like the Scutellerina. They have an almost equally large scutellum, which covers the greater part of the body, but there is a difference in the wing-venation ; the first two veins run very near and parallel to one another, so that they do not include a broad space. The insects belong chiefly to the Old World ; there are ninety-one Palaearctic species, but in Britain only one has yet been discovered, and almost all the rest are southern in their distribution.

5. **Podops inuncta** Fabr.

Fab., E.S. iv. 90, 45 (1794) ; D. & S., B.H. 73 (1865) ; Saund., H.H.B.I. 17 (1892).

Ova. I have no knowledge of the eggs of this species, nor of the earlier stages of the larvae.

Larvae. The following is a description of a nymph which I found at Yarmouth, I.W., in August, 1911 : Length 4¾ mm. ; ovate, broadest behind ; colour greyish ochreous, the fore parts marked with black, and the abdomen with reddish spots ; a streak of red also appears on the wing-pads ; the surface is strongly punctured all over, most of the punctures being concolorous, but some black ; head shaped as in imago, but rather broader ; pronotum with anterior angles prominent and acute, but not forming a tooth-like prominence as in the adult ; margins foliaceous, especially behind, where they do not show the excavation that appears on the margin in the adult ; on the pronotum are two small pale callosities and two similar ones at the base of the scutellum ; wing-pads extending rather farther than scutellum, which is normal in size ; abdominal scent-glands prominent, three in number, with oval openings at the sides ; legs reddish ochreous, tarsi two-jointed, and shaped as in *Odontoscelis ;* antennae as in adult, but with terminal joint stouter ; the punctures are missing at the junctions of the abdominal segments in the connexivum, thus producing the appearance of pale spots ; the cast skin is almost colourless, save for the punctures and an infuscation of the last tarsal joints.

Another nymph which I found in August near Maidenhead was of a pale greyish ochreous colour with black punctures, and proportionately narrower than the imago, though sufficiently similar to be recognised for what it was. The merely normal size of the scutellum shows that, as in *Eurygaster* and *Odontoscelis*, the great development of this part takes place at the last moult, and is no doubt connected in some way with the acquisition of wings.

Life-cycle. The insect matures in August, and the imago has been taken in all the months from March to November inclusive, except July, for which I have no records. During this month the insect would of course be larval. T. R. Billups took a specimen in January, 1885, at Headley Lane ("Proc. Ent. Soc. Lond.", 1885, iii), so that the species is evidently a hibernating one, and there are probably no months during the year except perhaps July in which it may not be found. With these hibernating species it is probable that oviposition takes place in the spring, otherwise there seems no particular purpose in the hibernation. Both sexes survive the winter, so that impregnation may possibly be deferred till the spring, to be quickly followed by oviposition.

Habitat, etc. *P. inuncta* is usually found at the roots of plants, and there is every probability that it rarely leaves the ground, but generally remains more or less in obscurity and retirement. Saunders, however, records it as taken by sweeping, and Jennings (3) took a specimen in June in that way in a marshy field bordering the river Lea. It is sluggish and inactive, and seems to rely, for protection, upon its resemblance to the soil on which it lies. It avoids the light, and when exposed, seeks to hide itself under anything available. It is certainly not attached to any particular plant, and its tastes are probably carnivorous. Hall (3) records it from amongst sand and moss at Deal and Dover; Bloomfield (3) from a sandpit at Guestling near Hastings, in May; Linnell under stones; and Jennings (3) from under *Helianthemum vulgare* at Tring. He also records it from both chalky and sandy localities. I have taken it commonly on clay soils, and at Swalecliffe, Kent, I found it abundantly on some waste land by the coast, and similarly at Pegwell Bay. In such places it lies amongst the miscellaneous rubbish that collects under the plants, consisting of twigs and bits of plants, empty snail shells, small stones, remains of seeds, etc. I have also found it in April on sandhills at Camber, near Rye, under *Artemisia maritima*. Near Maidenhead I once met with an imago and a nymph in a mouse-run under fine grass. It has occurred also under *Urtica dioica*. Guérin and Péneau mention that it occurs under moss in winter, and also that it is very abundant in flood refuse. Wolff curiously enough says "in arboribus sylvaticis," which is hardly likely to be correct. Populus gives at the foot of poplar trees and on *Ranunculus* at the margin of marshes in France. (Cat. Hem. Dep. Yonne.)

Distribution. *P. inuncta* occurs throughout the greater part of the Palaearctic region. It is common and very generally distributed in the South of England, but rare or absent farther north. It is recorded from all the coast counties as one passes southward and westward from Norfolk to Somerset, as well as from the inland counties of Surrey, Middlesex, Berks, Wilts, Bucks, Oxon, and Cambs. There are also records from Northumberland and Glamorgan, but it is not known from either Scotland or Ireland. In Norfolk it is scarce, only one specimen being in fact recorded, taken by Mr. Thouless in his garden at Norwich. Too much stress, however, must not be laid upon the absence of records, as it is so unobtrusive an insect that none but professed Hemipterists would be likely to come across it. Its distribution, therefore, may be wider, and probably is, than the above records would imply. Several other species of *Podops* are found in Europe, distinguished partly by differences in the form of the pronotal process ; but they are mainly southern insects, and are not likely to occur with us.

Sub-family III. **Cydnina.**

Of this group we have but nine British representatives, a small selection from a rather large Palaearctic contingent, but one which is not likely to be much increased. The outline of these insects is oval, largely conditioned by the fact that the costal margins of the hemielytra do not allow any part of the abdomen to be seen from above. Their strongly setose tibiae are also a noteworthy feature, which is not, however, in all cases associated with sand-loving habits. Mulsant and Rey suggest that their comparatively short rostra enable them, if need be, to feed upon animal as well as vegetable juices, but this does not seem to be more than a conjecture. The hairs and bristles with which some of the species are furnished often suffer much from wear and tear, and this adds to the difficulties of identification. The ova of this sub-family are quite unknown.

Cydnina are numerous in the tropics, and in India are freely attracted to light. (Lefroy.)

6. **Thyreocoris scarabaeoides** L.

Lin., S.N. i. 716, 44 (1767) ; D. & S., B.H. 58 (1865) ; Saund., H.H.B.I. 14 (1892).

Ova. Nothing is known of these.

Larvae. Last instar 3½ mm. Oval, very convex above ; fore-parts bronze-black, abdomen white with black punctures and central bronze-black bars, and a similarly coloured semi-circular spot at lateral margin of each segment ; head broad, transverse, rounded in front, with anterior margin slightly reflexed, and central lobe projecting slightly beyond side lobes, the whole strongly punctured ; pronotum long, strongly convex, anteriorly emarginate for the reception of the head, which is sunk in it up to the eyes, posteriorly truncate but slightly sinuate at sides, lateral margins rounded, slightly ampliate, especially at anterior angles, a strong central longitudinal sulcation on the hinder part of disc, the whole surface rugosely punctate ; mesonotum slightly longer than pronotum, showing a strong central rounded scutellum, and small wing-pads which do not extend much beyond the scutellum, the whole more or less rugosely punctate and with a fine central sulcation ; on both pro- and meso-notum there is a laevigate callosity on each side ; abdomen with a thin red margin to fourth segment just behind the third black bar, and also a dark red line at margin of first segment ; under side coloured like the upper ; legs brownish, tibiae spinose ; antennae four-jointed, pitchy, with second joint brownish. J. Sahlberg gives the following description : Subaeneo-nigra, abdomine rufo-testaceo, supra lineolis transversis, maculis duabus magnis in medio, aliis minoribus in singulo segmento lateribus circa stigmata nigris.

Life-cycle. The insect matures in August ; I have found a larva in its last instar about the middle of the month, and Jennings found one as late as the 29th, together with an imago which was still pale from its recent ecdysis. I have found the imago in both August and September. But there are also spring records (Douglas and Scott, 1) ; W. West records it from Box Hill in April, and I have taken it in the same place in June ; V. R. Perkins had it from Wotton-under-Edge in April. Bedwell also took it in May, as well as in September and October. Hence it evidently hibernates as imago, the autumn brood apparently existing on through the winter and appearing again in the following spring. For the production of imagines in August there would probably be needed an exclusion from the egg in the early summer, but there is nothing to show what is the time of oviposition.

Habitat, etc. As to the food of *T. scarabaeoides*, all that can be said is that I have seen it piercing the seed-capsules of violets. An American species of the same genus does much harm by piercing the stems of strawberries, raspberries, cherries, and other fruits, and injuring garden flowers.

As regards habitat, I believe the experience of British Hemipterists is that it is almost always found on or near the ground, either under fallen leaves, even when they are quite dead and dry, or in moss, especially in sandy places, or amongst fine grass in similar localities, or in moss on hedge-banks (Jennings, 2), amongst violets, and in chalk-pits. Jennings (1) found it at roots of violets on Box Hill ; these were growing amongst moss, and as a nymph was present as well as imagines, the species was evidently " at home." In this case, however, the insects were amongst the violet plants and not in the moss. I have found it resting on the leaves of violets, particularly on partly closed ones just where the blade of the leaf joins the petiole, and where the funnel-shape of the leaf gives an all-round support. I have found it in some numbers also on the coast sandhills at Pendine, Carmarthenshire, where *Ononis* was growing abundantly. Other records are, on hill-slopes at Folkestone (E. C. Rye), in a heap of flint stones at Rotherfield Peppard, Oxon (Fowler, 4). Chitty (4) records it from an old and decayed hedge, but does not state whether on the ground or not. The continental records are somewhat different. Puton (3) says that, in France, it occurs by sweeping in meadows, especially on *Ranunculaceae ;* (this statement is first found in Wolff's " Icones," 1800) ; and Fieber says " on flowers in meadows." Schumacher, however, records it as burying in the sand, and as running about on the ground under low plants such as *Calluna, Gypsophila, Thymus*, and never as found on plants. Fallén records it from cultivated fields in September, and Guérin and Péneau say that it hides in winter under moss and amongst detritus. Populus gives "in woods"; J. Sahlberg says in sandy and stony places under the root-leaves of *Verbascum thapsus*.

One must conclude, therefore, that it is essentially a ground insect, and the spines on the tibiae are likely to be serviceable for locomotion over such an uncertain support as loose sand or the soil of chalky hillsides.

When disturbed, the insect folds up its legs and feigns death, and then looks rather like a small Histerid beetle. It is fairly active in its movements, running in a fussy way, and trying to get out of sight.

Distribution. *T. scarabaeoides* is found throughout Europe and extends into Asia Minor and northern Africa. In this country it is recorded from the following counties: the coast counties from Norfolk round to Glo'ster except Suffolk and Sussex, and from Lancs, Cambs, Oxon, Berks, and Surrey, and in Wales from Glamorgan and Carmarthen. It is thus mainly a southern insect. On the Continent it extends to 61° 40′ N. lat. Its absence from the lists for Suffolk and Sussex is noteworthy, as these counties have been well worked. It is not recorded from either Scotland or Ireland. This is one solitary representative of a large genus, almost all the species of which belong to the New World.

7. **Cydnus flavicornis** Fabr.

Fab., S.R. 184 (1803); E.M.M. xxxv. 155.

Description. "Dark piceous brown, shining, short, sub-elliptic, convex; margins clothed with a series of long reddish hairs; abdomen beneath also with scattered long hairs; margins of head reddish, set with short brown spines; antennae sometimes pale, but in this example (see below) dark brown like the head; pronotum largely punctured at base; scutellum dark brown, its apex paler, largely and somewhat remotely punctured; membrane brownish white; tibiae very densely spinose; tarsi pale testaceous. Length 3½ mm." (Saunders.)

Ova and **Larvae.** I have no information about the early stages of this insect.

Life-cycle. As an imago it has been found in April and July.

Habitat, etc. In Jersey and on the coast of France it occurs on the sand-dunes, but it is found in sandy places inland as well. Mulsant and Rey give "dry sandy or grassy places" as its habitat. Dalla Torre mentions finding it on *Centaurea scabiosa*. Mulsant and Rey consider that the hairy nature of this and other species of the genus is an evidence of fossorial habits, and Guérin and Péneau say definitely that such are its habits. The latter authors further state that it generally remains at the roots of plants in sandy places, but that it probably comes from its hiding-place at night, as it is often found in the morning under dried seaweed at the foot of the sand-dunes. I have found it in spring in Jersey quite buried in sand.

Distribution. It is widely distributed in Europe, though absent from the northernmost parts; in this country only a single specimen has been found. It was taken by Mr. W. W. Holland at Freshwater, I.W., July, 1895.

8. **Geotomus punctulatus** Cost.

Costa, Cim. Cent. ii. 30 (1847); Saund., H.H.B.I. 18 (1892).

Ova and **Larvae.** Of this species also the early stages are, so far as I know, undescribed.

Life-cycle. The imago has been found in April and from June to September, and it passes the winter in this form.

Habitat, etc. It occurs in sandy places, under stones, *Erodium*, etc., often more or less buried in sand. According to Mulsant and Rey it occurs at the roots of various plants, the juices of which it sucks, and they mention specially *Koniga maritima* (*Alyssum maritimum*). It appears to be chiefly a littoral insect, though also found inland. According to Guérin and Péneau the imago occurs in June on bushes, especially hawthorn; it comes more into the light than the rest of the Cydnina, but in winter it seeks shelter under stones.

It presents several variations, four of which have received names :—

Var. *laevicollis* Costa has scarcely any puncturation on the pronotum, and that of the hemielytra is weaker than in the type form.

Var. *bifoveolatus* H.S. has the pronotum smooth and the transverse impression very indistinct, and also the legs reddish testaceous or brownish.

Var. *aciculatus* Fieb. has the pronotum smooth and the transverse impression absent or very indistinct.

Var. *episternalis* M.R. has the sides of the sternum with three rows of punctures.

Distribution. It is generally distributed in Central and Southern Europe, North Africa, Asia Minor, Turkestan, and Japan, and is quite common on the sandhills of the Channel Islands. In this country it is recorded from two localities only, White Sand Bay, near Land's End, whence most of our specimens have come, and Cowbridge in Glamorgan, where T. R. Billups found two specimens under stones.

9. **Sehirus bicolor** L.

Lin., F.S. 250, 936 (1761); D. & S., B.H. 52 (1865); Saund., H.H.B.I. 19 (1892).

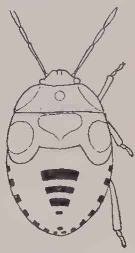
Ova. Of the eggs of this species I know nothing.

Larvae. I have found the larvae on *Stachys sylvatica* at Fleet, Hants. The young larva is very much like that of *Eusarcoris melanocephalus* (*q.v.*), which also is found on the same plant, but it is without the pale line at the margins of the thorax which characterises that species, and there is a pale patch in the middle of the pronotum.

The youngest larva I have measures 3¼ mm., and is probably in the third instar. It is short oval, very convex, and broadest across the thorax; the fore parts shining black except the scutellum, which is yellowish; abdomen shining greenish-yellow, punctured rather remotely with black; in the centre three broad blackish bands, indicating the region of the scent-glands; legs and antennae black. In this specimen the first faint indication of the wing-pads appears.

Later instar, 5 mm. Rather more regularly oval, and not quite so shining as the above. The black of the fore parts has now a faint bluish tinge; sides of pronotum broadly yellow, and a yellow spot in the centre; the yellow scutellum with a small black triangle at each of its basal angles; wing-pads prominent, with a large yellow patch outwardly; the three bars of the scent-glands much more distinct; connexivum marked with black squares, separated from one another by the yellow ground colour, at the junctions of the segments; antennae and legs still black; the whole insect very convex.

Another specimen representing the same instar measures 6 mm., and the abdomen is still more distended and convex.



Nymph of *Sehirus bicolor* L.

The cast skin retains the whole of the black pigment, but the parts which were yellow have become almost colourless.

Life-cycle. Like most other *Pentatomidae*, *S. bicolor* matures in August, and most of my specimens were taken in that month. As Douglas and Scott (1) found it amongst grass and other herbage in the spring, it evidently hibernates as an imago. In fact I have distinct records for every month from April to December inclusive, except October. Fallén says it occurs under stones in spring. Thus there is probably no month in the year in which imagines do not occur, and oviposition would probably take place in the spring.

Habitat, etc. Sweeping or beating bushes is generally the method by which *S. bicolor* is captured; it is certainly less of a ground lover than the majority of the Cydnina. It has occurred in nettle-beds, amongst ivy and under *Artemisia vulgaris*, and is most commonly obtained by sweeping the roadside vegetation in country lanes. Tuck found it taking shelter under the bark of trees, and also sometimes in ants' nests as larvae. (Morley, 4.) Parfitt records it from under dead leaves, and Linnell from under stones. Mulsant and Rey say that it occurs on garden vegetation and also on fruit trees, and Dalla Torre records it from roses and brambles. Reuter mentions having found a specimen on *Pinus sylvestris*, but this was probably an accidental occurrence. Populus gives "on labiates," and Jennings confirms this.

This great variety of habitats may perhaps be taken as indicating that the insect has carnivorous tastes; for the only feature they have in common is that there would be in all plenty of insects of other kinds, as well as small

Arachnida, on which the bugs might feed. The occurrence of the larva on *Stachys*, however, seems to imply that in that condition the insect is a vegetarian ; but, of course, nothing really definite can be concluded without more direct evidence.

There is a malformation sometimes occurring amongst the Heteroptera, to which Douglas gave the name " oligomery of the antennae." It consists in the suppression of one of the antennal segments, usually the penultimate, while the terminal joint is elongated as a compensation, which, however, is only partial, as the antenna still remains of less than normal length. It usually occurs in one antenna only, the other remaining quite normal. It is not confined to either sex, and the insect is in other respects perfectly developed. This malformation is seen most frequently amongst the *Lygaeidae*, but it occurs in other families also, and the present species is an example of this. The cause of the abnormality is not known, but, whatever it may be, it must be sought for either in the larval stages or at the last moult. The irregularity can hardly be the result of damage to the larval antenna, seeing that such damage might be expected to produce not merely malformation, but also distortion, which is never the case. The elongated joint is always perfectly symmetrical. In the whole of this genus the antennal segments are very loosely articulated, the point of junction being minute, and in consequence segments are easily lost. There is, of course, the possibility that this may be an attempt of nature to repair the loss of a couple of joints, or perhaps of one only, by the elongation and altered character of the preceding one ; for the form of the elongated joint is always that of the terminal one, and not that of the penultimate. It will be seen that this shortened imaginal antenna preserves the number of joints that are normal in the larva, in other words, that there is no division of one joint into two at the last moult, such as usually takes place.

Distribution. *S. bicolor* occurs throughout Europe, and in Siberia, Turkestan, and the north of Africa ; in Britain it is apparently the most widely distributed species of the genus. It occurs as far north as Northumberland, and the only county south of the Thames from which it is not recorded is Sussex. Its absence from the Sussex list is peculiar, as the Hemipterous fauna of that county is very well known. Besides the counties already mentioned, it is found in the lists for Durham, Notts, Leicester, Warwick, Worcester, Glo'ster, Oxon, Bucks, Herts, Norfolk, Suffolk, Cambs, and Essex ; the only Welsh record is from Glamorgan, and there are no records at all from Scotland or Ireland, although on the Continent it occurs as far north as 60° 25′.

A very closely allied species, *S. sexmaculatus* Ramb. occurs in the more southern parts of Europe ; it may be distinguished by the head being flat instead of excavated, as in *S. bicolor*.

10. Sehirus dubius Scop.

Scop., Ent. Carn. 121, 355 (1763); D. & S., B.H., 53 (1865); Saund., H.H.B.I. 19 (1892).

Ova. I have not been able to obtain the ova of this species.

Larvae. I have larvae in two instars, kindly supplied by Mr. F. B. Jennings. The younger ones measure from $2\frac{1}{4}$ mm. to $2\frac{3}{4}$ mm., and the older, which are apparently in the last instar, 4 mm. Both are similar in coloration and general structure; oval, head and thorax, three broad transverse bars on the abdomen, and a large semi-circular spot at the lateral margin of each abdominal segment, shining black, with a blue reflection; rest of abdomen crimson; legs and antennae pitchy; anterior and intermediate tibiae strongly setose, posterior less strongly so; head with lateral margins reflexed, rugose towards the sides, with a few punctures amongst the rugosities; thorax rather strongly punctured, slightly rugose in parts. In the smaller larvae the wing-pads are minute and do not extend beyond the metanotum; in the larger ones they are much more fully developed, and their inner margin meets the ends of the first abdominal bar. In the cast skin all the dark parts are pitchy black with blue reflections, and the rest is more or less hyaline. The blue reflections, which are not strong, and can be seen only in certain lights, will enable the species to be recognised.

Life-cycle. As this is one of our rarer species, few opportunities occur of studying its life-history; but some idea of the course of its development may be gathered from the few facts that are known. Thus, the above larvae were found towards the end of August, 1913; a considerable number were taken and were in the above two instars, with a few younger ones, and the older ones would probably have become imagines by the middle of September. The imago has been found in August (Dale), in April in moss (H. A. Saunders), in March, May, September, October, and November (Bedwell), and in winter in moss under junipers on the chalk Downs near Croydon (Champion). Thus it lives through the winter as an imago, which is probably the case with most of the *Pentatomidae.* Oviposition probably takes place in spring.

Habitat, etc. On the Continent it is said to occur on *Thesium ramosum* (bastard toad-flax), but as this is not a British species it cannot be confined to this particular plant. We have a British *Thesium, T. linophyllum,* which has a very restricted area, but an area which corresponds to some extent with that of the bug. With us, however, it has been found mainly amongst fine grass, though T. R. Billups records taking a specimen sitting upon a dead stem of marjoram (*Origanum vulgare*) in May. Guérin and Péneau say that it lives on thyme. I have seen specimens trying their rostra on grass-blades, on the dead body of a fly, and on one another, but apparently without any result in either case. When disturbed it tucks up its legs and feigns death. Jennings reports that it has, in the larval condition, the habit of congregating together in clusters of twenty or thirty on grass stems or other low herbage. The general effect of the clusters was that of red and black berries, and they consisted of individuals of various sizes, but all similarly coloured except one which was entirely pale red. I have found also that they similarly clustered in corners of the box in which they were kept.

This species is variable both in colour and in size. In colour it ranges from black through purplish-blue to steel-blue or metallic-green, and the membrane is sometimes white and sometimes smoky-brown. In size it may be anything from 4¾ mm. to 8 mm.; British specimens, however, are usually pretty uniform in size.

Distribution. *S. dubius* is distributed throughout the continent of Europe, together with Algeria, Tunisia, Asia Minor, Turkestan, North Persia, and Siberia, but in the British Isles its area is very restricted, consisting of five counties only, which form a compact district in the south, viz. Surrey, Sussex, Berks, Hants, and Dorset.

11. **Sehirus biguttatus** L.

Lin., F.S. 250, 935 (1761); D. & S., B.H. 54 (1865); Saund., H.H.B.I. 20 (1892).

Ova. Of the ova of this species I know nothing.

Larvae. Last instar, 4 mm. Short oval; fore parts pitchy black, abdomen reddish, area of scent-glands with four bars concolorous with fore parts; connexivum with similarly coloured quadrate spots, occupying almost the whole space; margin of pronotum and of wing-pads slightly pale, indicative of what will become the yellowish margin; no trace on the wing-pads of the yellow spots which are so conspicuous on the hemielytra of the adult, and from which the species gets its trivial name; setose legs and antennae black. The cast skin retains the colour of all the dark parts but the rest is transparent, with a slight pink tinge.

Life-cycle. The insect matures in August, and evidently hibernates, as it has been found in moss in winter in Bentley Wood, Suffolk (Morley, 4), and in February and March under the "dog-lichen," *Peltidea canina* (Parfitt). E. P. Collett (1) also records it from moss in March. Douglas and Scott (1) speak of its being taken in spring and autumn, and Marshall records it from Scotland in June and July. This, therefore, is another of the species which probably exist in the imago form all through the year; the records are continuous from February to August.

Habitat, etc. It occurs frequently in moss under *Calluna*, where I have found it in all its stages; it has been found also in sand-pits (Bloomfield), under dead leaves and stones, and at the roots of plants on wayside banks, both in sandy and in chalky districts (Hall). On such a bank on a clay soil I have found it in company with *Rhyparochromus antennatus*. Under the *Peltidea*, as above, it was accompanied by *Sehirus luctuosus*. Fallén says it occurs in flowers, but with us it appears to be entirely a ground insect.

Distribution. *S. biguttatus* occurs throughout Europe, and in Britain it is more widely distributed than *S. dubius*. The records are chiefly from south of the Thames, where it occurs in all the coast counties from Kent to Cornwall, and from Surrey and Berks; but it is recorded also from Cumberland, Oxon, Essex, and Suffolk, and from Carnarvonshire in Wales; Norman found it at Pitlochry, Perthshire, and Marshall at Loch Lomond. Probably, therefore, it occurs in other heathy districts as well. There are no records from Ireland. On the Continent it extends as far north as 65° 10′.

12. **Sehirus luctuosus** M. & R.

M. & R., H.N.P. Pent. 52 (1866); D. & S., B.H. 55 (1865) (morio); Saund., H.H.B.I. 20 (1892) (morio).

Ova. The egg of this species is apparently undescribed.

Larvae. The larvae in their last instar are black, and similar to the imago in shape. I have seen them running about in a gravel pit on St. George's Down, I.W.

Life-cycle. As usual, the insect matures in August, but since it is recorded by Douglas and Scott (1) as found both in spring and autumn, and since Bedwell has taken it in March and May, it evidently hibernates as imago. The records are continuous from March to September.

Habitat, etc. *S. luctuosus* is entirely a ground-loving species, and must be sought for at the roots of plants. I have found it on the Dorsetshire coast on chalky soil under *Nepeta glechoma;* Jennings (1) found one at the roots of a *Verbascum* plant, and another under a stone on Box Hill (also chalky), and a fortnight later he took two more at the roots of *Hypericum perforatum.* Parfitt found it, as already mentioned, under the "dog-lichen," *Peltidea canina*, near Exeter, and J. Edwards has met with it commonly in a derelict field near Colesborne, Cheltenham, where it was difficult of capture, because of the readiness with which it ran into cracks in the soil. Collins records it as occurring on the ground under the leaves of *Echium vulgare.* Mulsant and Rey describe it as occurring on sandy soils, and Schumacher as burying itself in the sand. Guérin and Péneau say that it occurs in May and June on various plants.

This insect is one of several closely allied forms which inhabit the Palaearctic region and are distinguished by their uniform black colour. The present species is the only one of the group that has a slight aeneous reflection. According to Horváth, who has made a special study of these black forms, *S. luctuosus* has the membrane either white or smoky. We have both forms in Britain, the smaller with smoky membrane, and the larger with membrane more or less white. *S. morio* L., on the other hand, has the membrane always white, much whiter than *S. luctuosus,* and it is larger and has no aeneous reflection. Reliable evidence that this latter species occurs in Britain is still to seek.

Distribution. *S. luctuosus* is another widely distributed European species, extending into Algeria, Asia Minor, and Turkestan. In Britain, the records are mainly from south of the Thames, viz. the counties of Kent, Surrey, Berks, Hants, Dorset, and Devon, but it has also been found in Lancs, Norfolk, Suffolk, Glo'ster, and Oxon, and in Glamorgan in Wales. It is not recorded from either Scotland or Ireland, although on the Continent it has occurred as far north as 63° 10′.

13. **Gnathoconus albomarginatus** Goeze.

Goeze, E.B. ii. 250 (1778) ; D. & S., B.H. 56 (1865) ; Saund., H.H.B.I. 21 (1892).

Ova. There is no information available as to the ova of this species.

Larvae. I have some very young larvae, evidently in their first instar, which, I think, must belong to this species. They measure 1½ mm. and have the fore parts shining black, unpunctured, and the abdomen bright red with the usual three black bands in the region of the scent-glands, and the connexivum adorned with quadrate black spots ; legs and antennae black, last two joints of latter strongly fusiform, last joint the largest of all ; the three thoracic segments are simple black bands, gradually decreasing in length (*i.e.* the width of the *band*) as they pass backwards ; central lobe of face projecting beyond side ones, which is remarkable if these really are the larvae of *G. albomarginatus*, seeing that in the adult the side lobes are considerably longer than the central one ; legs slightly setose.

Later instar, probably the last, 3 mm. Fore parts shining pitchy black, strongly punctured ; outer margin of pronotum and wing-pads lighter ; abdomen pink, with a large pitchy patch consisting of four bands joining one another, indicating the region of the scent-glands, and with pitchy quadrate spots on the connexivum ; antennae and legs pitchy black, the last two joints of the former strongly fusiform, last joint the largest ; tibiae strongly setose ; central lobe of head as long as side lobes. The cast skin shows the dark parts of the body brown and the rest colourless ; the legs and antennae are yellowish.

Life-cycle. The larvae are not often seen ; the eggs probably hatch in early summer, or rather, late spring, and the insect completes its course during the summer months, becoming an imago before autumn. The very young larvae mentioned above were taken, some on the 28th May, and another on the 6th June, and they had evidently been in each case not more than a day or so out of the egg. In winter the imago is found amongst dead leaves, and in early summer is very active, sometimes taking wing in the bright sunshine. I have other records of the capture of the imago in the months from March to September inclusive. This, therefore, is, no doubt, another of those species that are in the imaginal form in every month throughout the year, the adults of each year overlapping the young of the following year, and lasting till the new adults appear.

Habitat, etc. In early summer, *G. albomarginatus* is most frequently taken by sweeping flowery banks; but it may also be seen running by the side of the road, or even on doorsteps in towns. It also occurs in moss, at the roots of plants on dry banks, under leaves at the bottom of hedges, and in sandpits (Linnell). Morley (4) found it under stones in September, possibly in preparation for hibernation. It is unquestionably our commonest species amongst the Cydnina. According to Fieber, it is found on the Continent in sunny, sandy places, and on stony hills under *Clematis erecta*. Mulsant and Rey speak of capturing it by beating trees and hedges, and Amyot and Serville add that it occurs in gardens. Populus says, " dans les joncs et les renoncules aquatiques." It has been found exhibiting oligomery of the antennae.

As illustrating the difficulties that may beset an ecdysis, reference may here be made to a specimen found by Mr. F. B. Jennings, which, though mature in other respects, had one of its legs left in the larval condition. The explanation of the abnormality is, no doubt, that the claws of that particular limb became detached from the support when the insect was withdrawing from its skin, and therefore the leg could not be pulled out of its covering, as there was no *point d'appui;* the larval skin therefore remained on the leg, and was thus torn away from the rest of the slough as the insect withdrew from the scene of its transformation.

Distribution. *G. albomarginatus* is found throughout central and southern Europe and in Turkestan, Asia Minor, and Algeria; in this country also it is widely distributed, being recorded from all the counties on the east and south coasts extending from Norfolk round to Glo'ster inclusive, as well as from Durham, Cambs, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts. There are no records from either Wales, Scotland, or Ireland.

14. **Gnathoconus picipes** Fall.

Fall., H.S. Cim. 20 (1807); Saund., H.H.B.I. 21 (1892).

The **Eggs** and **Larvae** of this species are unknown, but as the imago bears so close a resemblance to the preceding, it may fairly be assumed that this resemblance extends to the earlier stages as well.

Life-cycle. As regards the life-history, there is not much information, but as W. West took the imagines in May and Bedwell in September, the later record probably represents the insect shortly after its emergence as an imago, and the earlier one, after hibernation. It has also been found in July and August.

Habitat, etc. Its habits are probably similar to those of the preceding species, though it is far less general in its occurrence. In fact, with us it seems to be chiefly associated with a wild violet, probably *V. canina*.

W. West found it in July, and Commander Walker at the end of September, in both cases at the roots of violets. On the Continent, in Austria and Italy, it is said to occur on *Galium verum* and *G. ochroleucum*. Mulsant and Rey say that it is found on sandy slopes, and by the seashore.

Distribution. This species occurs over Europe generally and in Turkestan, but in Britain its distribution is much more restricted. Its chief locality is Great Yarmouth, though its area extends from Lincs as its most northern station to the Isle of Wight as its most southern and western. For the country between it is recorded only from Kent, Surrey, and Berks.

Sub-family IV. **Pentatomina.**

The Pentatomina are our largest sub-family of the *Pentatomidae*, and yet our insular representation of the group is very fragmentary, numbering as it does only fourteen species out of nearly three hundred catalogued by Oshanin, and these are distributed amongst twelve genera. But they contain some of the best-known members of the whole family, and such as are most likely to fall into the hands of the uninitiated. They are of world-wide distribution and constitute a majority of the *Pentatomidae* in any Fauna. They are distinguished chiefly by negative characteristics; thus, the scutellum, while variable in size, is never so large as to cover the hemielytra; the legs are not strongly spinose, nor is the body oval in outline; the rostrum is slender and lies between the bucculae, which are not united behind; the tarsi are three-jointed.

In this section we have insects which readily use their wings. Of their flight Poujade speaks as follows: "J'ai été témoin plusieurs fois des préparatifs du vol chez les Pentatomes. L'animal commence par replier ses pattes sous son corps, puis écarte un peu ses hémélytres, qui, se pliant au clavus, se relèvent par dessus le dos à la façon des élytres des Necrophores et des Silphes, mais sans se toucher, leurs insertions étant trop éloignées l'une de l'autre; ensuite il étend ses ailes presque horizontalement et part avec une telle rapidité qu'il est impossible de saisir le moment où se fait l'accrochement. Il m'a été facile de constater la réunion des deux paires d'ailes pendant le col rendu captif au moyen d'un fil attaché à une patte." ("Ann. Ent. Soc. Fr.", 1884, p. 198.)

Table of Genera of Pentatomina.

1.	Sides of pronotum foliaceous	*Sciocoris.*
	Sides of pronotum not foliaceous	2
2.	Head pointed, deflected and strongly arched	3
	Head not pointed, but truncate or rounded in front	4
3.	Head elongate, much attenuated in front	*Aelia.*
	Head short, subtriangular	*Neottiglossa.*

4.	Margins of head raised	*Eurydema.*
	Margins of head not raised	5
5.	Second ventral segment with spine or tubercle	6
	Second ventral segment without spine or tubercle	7
6.	Second ventral segment with a long spine	*Piezodorus.*
	Second ventral segment with a minute tubercle	*Pentatoma.*
7.	Species very short and robust	*Eusarcoris.*
	Species not very short and robust	8
8.	Insect green	9
	Insect not green	10
9.	Margins of pronotum reflexed	*Chlorochroa.*
	Margins of pronotum not reflexed	*Palomena.*
10.	Second joint of antennae longer than third	11
	Second joint of antennae not longer than third	*Peribalus.*
11.	Insect pilose	*Dolycoris.*
	Insect not pilose	*Carpocoris.*

15. **Sciocoris cursitans** Fabr.

Fab., E.S. iv. 67 (194); D. & S., B.H. 62 (1865) (terreus); Saund., H.H.B.I. 23 (1892).

Ova. The eggs of this species have not been described.

Larvae. The larva in its last instar is of the same shape and of the same ochreous colour as the adult. The fore parts are covered with black punctures, save for two callosities at the base of the scutellum, and a central line on the pronotum. The central lobe of the head is margined with dark brown. On the dorsal surface of the abdomen are two prominent pale transverse patches, black-punctured, and with a deep black spot at each end. These, of course, indicate the position of the scent-glands. The antennae are pale ochreous with the last joint dark. Length 4½ mm.

Life-cycle. I have records of the capture of the imago for all the months from March to October inclusive. Hence, it probably hibernates, reaching maturity in August. But there is no evidence to show when oviposition takes place, although the hatching of the eggs probably occurs in early summer.

Habitat, etc. This is the only British representative of a large genus of closely allied species, nearly fifty of which have been described, and by far the greater number of these are Palaearctic. It is difficult to understand why just this one species should be found in Britain, while there are two or three others equally widely distributed on the Continent which do not occur with us. For a long time *S. cursitans* was regarded as with us mainly a denizen of sandhills, its only known locality being the strip of coast running from Deal to Sandwich. Here it occurred with *Odontoscelis fuliginosa* on the grass- and moss-covered hillocks, and under *Erodium.* But in August, 1897, Mr. F. B. Jennings found one specimen at the roots of

Hypericum perforatum at Box Hill, Surrey, and four years later he discovered several small colonies at the same place, on some rough and very stony ground much overgrown with *Sedum*, and with patches of *Teucrium scorodonia* scattered here and there. The species was well established here, and larvae were found as well as imagines. The insects occurred chiefly in the crevices of the chalk flints at and near the roots of bushy plants of the *Teucrium*; and for this the flatness of body was very appropriate. None were to be found amongst the *Sedum*. Since then it has become quite common. I have swept it amongst *Teucrium* there in June, and Mr. Bedwell tells me that he has found it in several other places on the Surrey Downs. The occurrence of this species at Box Hill and other chalk hills shows that it is not necessarily a maritime insect, and, in fact, the inland specimens are often finer examples than those found on the sea coast, suggesting that it flourishes better on the chalk and away from the shore. Recently Mr. Keys has discovered it in Cornwall, near the Lizard, and these specimens are rather darker. On the Continent it may be found in sunny places inland as well as on the coast, at the roots of plants or under stones. It has also been found under *Echium scabiosum* and *Herniaria*, but the former is not a British plant, and the latter is very rare with us.

Hibernation does not necessarily take place on the spot on which the insect has lived. Dr. Reuter (19) records one instance in which it so far forsook its usual habits of dwelling on the ground as to mount into a juniper tree for the sake of wintering on an evergreen. This was in Switzerland in October.

Distribution. *S. cursitans* occurs in suitable localities throughout Europe and in Asia Minor and Siberia, but as already stated, in this country it was for a long time believed to be confined to Deal. It has, however, now been recorded from four counties, Kent, Surrey, Somerset, and Cornwall (Lizard district), and quite possibly it may some day be found in other southern localities. It occurs on sandhills in the Channel Islands.

16. **Aelia acuminata** L.

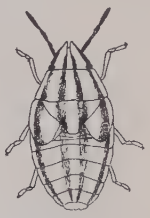
Lin., F.S, 251, 939 (1761); D. & S., B.H. 68 (1865); Saund., H.H.B.I. 23 (1892).

Ova. At Fleet, Hants, in August, 1903, I found *Æ. acuminata* very plentiful in all its stages on a small piece of waste land near the railway station, which has since been built over. It was covered with tall, dry, yellow grass-stems, with which, needless to say, the insects harmonised completely. As all stages were to be found at the same time, from the youngest larvae to the imago, the eggs evidently do not all hatch together, but their periods of exclusion must in this case have extended over some weeks. It would, probably, be safe to assume that oviposition followed a like course. But I have not been able to find any description of the eggs.

Larvae. The larvae, of whatever age, are oval and not angular; the very young ones, 1st or 2nd instar, have the head and thorax black, thickly and deeply punctured, and the abdomen pale red with scattered black punctures and with three dorsal black transverse bars, and black spots on the connexivum ; legs dark brownish, and antennae brownish with stout black terminal joints ; the head is very large and nearly semi-circular, with central and side lobes on the same level, lateral margins of pronotum ochreous and slightly foliaceous. Length 1½ mm.

The next instar, 2 mm., shows traces of three longitudinal ochreous stripes on the dark fore parts, and a narrow, pale, foliaceous margin appears all round the insect. The abdomen loses almost the whole of its red tint and becomes greyish ochreous, while the legs and antennae are black. The head is not quite so much rounded in front, and the central lobe is very slightly passed by the side lobes.

In the latest instars, 5½–6½ mm., the whole insect is paler, being marked with longitudinal streaks alternately of fuscous and ochreous, of which the fuscous ones are the broader and more indefinite. The pale border all round is much wider, and the legs are not so dark. The shape is still long oval, not angular, although the head has become more elongated, and not broad and rounded as it was at first, and the side lobes have far over-passed the central lobe. The wing-pads do not interfere with the general scheme of striped coloration.



Nymph of *Aelia acuminata* L.

Life-cycle. The perfect insect has been taken from April to September inclusive. As the larvae are found up to August, it will be seen that the August and September imagines have recently matured, while the earlier specimens must be over-wintered examples. The species evidently hibernates, and in winter it has been found taking refuge in pine trees and in juniper (Reuter, 19). There are probably five instars in the larval life.

Habitat, etc. This is another case of a solitary British representative of a fairly large genus, containing closely allied species, all showing the same type of ornamentation. There are few styles of decoration in the whole range of the Hemiptera more delicate than the exquisite pencillings of the longitudinal lines with which *Aelia* is adorned. As might be expected from its appearance, it frequents dry, grassy places, its ochreous colour and its longitudinal stripes harmonising exactly with the dry grass bents of its environment, and being possibly, therefore, protective in function. On August 15th, 1899, which was an intensely hot day, I took this species in company with *Neottiglossa pusilla*, *Coreus denticulatus*, *Spathocera dalmani*, *Verlusia quadrata*, and *Ceraleptus lividus* by sweeping the fine, dry, long grass growing on a small artificial mound of only a few square yards in extent, which apparently covered a water-tank. The mound was in a wood at Albury, Surrey, and the grass was most of it very dry and brown, and it was certainly remarkable to find such a collection of bugs of more or less similar coloration, closely allied as it was to that of the grass, associated together in the small compass of this mound. There must surely have been some subtle attraction between the ochreous bugs and the ochreous grass bents.

This species has been said to do damage to the ears of rye, and has been found also on wheat, barley, and rushes. An allied species is accused of having caused great damage tc corn crops in Algeria (C. R. Acad. Sc. Hebd., 1889). The larva has also been found on a thistle in August, and I have beaten it from the thatch of a haystack in the same month. The imago has also been found on broom, birch, juniper, clover, and amongst the vegetable débris under juniper bushes. Curtis says it has been found in May on ferns, including *Osmunda regalis*. It is said to mimic *Cariopsis*.

An account of some parts of its anatomy is given by Dufour (1).

Distribution. *Æ. acuminata* is distributed throughout the greater part of the Palaearctic Province, and in Britain has been recorded from the following counties: all the coast counties from Norfolk round to Glo'ster except Cornwall, and from Surrey and Berks; from Glamorgan in Wales, but not from Scotland or Ireland. Thus it is mainly a southern insect and found usually not far from the coast.

17. **Neottiglossa pusilla** Gmel.

Gmel., S.N. 2160 (1789); D. & S., B.H. 71 (1865) (Ælioides inflexa); Saund., H.H.B.I. 24 (1892) (inflexa).

Ova. I have not been able to find any account of the eggs of this insect, but Xambeu gives the following brief description of those of a closely allied species, *N. leporina* H.S., and probably these would be very similar. "Long. 0.5 mm., diam. 0.2 mm. Cylindrique, d'un blanc de nacre terne, visiblement pointillé, à calotte supérieure subarrondis, l'inférieure tronquée, à enveloppe très résistant." They are about twelve in number, and laid on the underside of the leaves of the food-plant.

Larvae. The following is a description of a nymph which I found in 1893 near Maidenhead. Oval, strongly convex; head, pronotum and wing-pads reddish ochreous, punctured and margined with black; extreme margin ochreous; two zigzag black streaks diverging from central lobe of face and extending half-way across pronotum; a pale central line from head to scutellum; abdomen pale ochreous, punctured with black; dorsal bands black, and a black patch at side margin of each segment; legs ochreous with last joint of tarsi black; antennae with first two joints ochreous and last two black; underside pale ochreous with black punctures and black margins to thoracic segments, and black band in centre of abdominal segments.

I took a number of quite young larvae at Byfleet, June 19th, 1915.

1st instar, $\frac{3}{4}$ mm. Very convex, very coarsely punctured; head semicircular, very large; eyes prominent; head and thorax shining black, abdomen ochreous with strong black punctures and three large transverse black bars in middle; thorax longer than abdomen, metanotum a little shorter than the other thoracic segments; legs and antennae ochreous, last joint of latter the largest.

2nd instar, $1\frac{1}{2}$ mm. Similar, but with thorax ochreous, carrying four dark streaks, two of which are marginal; last joint of antennae piceous; hind margin of mesonotum projecting in centre; metanotum shorter.

3rd instar, 2 mm. Similar, but with the four dark lines on thorax broader and much darker; hind margin of mesonotum sinuate, showing beginnings of wing-pads at sides; whole margin of insect ochreous, abdominal segments each with quadrate dark spot within this.

It will be seen that these early stages are much like those of *Aelia*, but differently coloured.

Life-cycle. The above-mentioned nymph was taken on August 7th, and during the same month imagines may be found. It therefore matures in late July or early August. Kirkaldy found specimens *in cop.* on June 6th, 1903, so that the eggs would probably be laid in June. Xambeu says that the eggs of *N. leporina* are about twelve in number and are laid on the underside of the leaves of the food-plant, or along the stems, and a similar arrangement would probably hold good for this species. It evidently hibernates, as it was found by Champion in May. It apparently retires in early autumn, as Reuter (19) speaks of its being found on juniper in September, and this was probably for wintering purposes. Dale records it in October, and Douglas and Scott (1) in July and August, so that the records are continuous from May to October.

Habitat, etc. It is generally taken by sweeping in grassy places, though usually not such very dry ones as the preceding species. Flor gives "grass under birch trees." When it occurred on the very dry mound with *Aelia* and the rest, as detailed under that species, the question naturally suggested itself, "What were these insects all doing there together?" They could hardly have been there for feeding purposes if they were vegetarians, for the amount of moisture left in the very dry grass-bents must have been infinitesimal, and even what there was very difficult to obtain. Were they there simply to sun themselves and enjoy the heat? for this and the preceding species are particularly active in very hot weather. In the same wood, but in a much greener and more shady part, I found this species much commoner than I have ever seen it elsewhere. Collins records taking it by sweeping among heather and young larches, and H. R. P. Collett on honeysuckle. Besides grasses, it has been recorded from *Carices*, *Compositae*, and *Umbelliferae*.

It should be noted that the scutellum of the ♂ is a little narrower than that of the ♀.

Distribution. *N. pusilla* is found throughout Europe up to 65° and in Siberia. In Britain the records are chiefly from south of the Thames; it is recorded from all these counties from Kent to Somerset, except Wilts. The other English records are from Worcester, Glo'ster, Oxon, Bucks, Herts, Suffolk, Essex, and a single specimen from Norfolk. But it has not been observed in either Wales, Scotland, or Ireland.

18. **Eusarcoris melanocephalus** Fabr.

Fab., E.S. 12, 176 (1794); D. & S., B.H. 75 (1865); Saund., H.H.B.I. 25 (1892).

Ova. The egg of this handsome species does not appear to have been observed.

Larvae. In August, 1903, I found a very large colony of larvae on *Stachys sylvatica* at Crookham, Hants, by the side of the Basingstoke Canal. At the beginning of the month they were quite small, but the season was a late one, and only a few matured before September; thus the insects must have been something like six weeks in reaching maturity. Larvae of all ages were present at the same time, and they were observed only on the plants that were overblown. They rested on the long flowering stem, clustering among the calyces of the fallen flowers. The spikes of the plants thus attacked gradually turned brown, and the development of the seeds would probably be interfered with. They were very local, but where present were very abundant; in the net at one time there would be a score or so of them. They were very sluggish, and simply remained clustered round the plants after the manner of Aphides. In this case there is no doubt that the diet was a vegetable one, though I did not actually see them feeding.

The following is a description of the nymph: Length 4 mm. Body short oval, broadest across the scutellar region and with a peculiar stumpy appearance; head, thorax, and wing-pads black with bronzy lustre, the pronotum and base of wing-pads being white-edged; two white spots at sides of scutellum; all the fore parts strongly and rather closely punctured; abdomen greenish ochreous, with scattered black punctures, three or four central black bands, and each segment with a marginal black spot; underside similarly coloured, save that the sternal space between the coxac is pale; rostrum black, with second joint pale; antennae black with joints narrowly pale at base. The very young larvae have the abdomen orange. It will be seen that there is in the nymph no trace of the beautiful coppery tint which makes the adult so handsome; that is acquired at the last moult only. The cast skin shows all parts black with a slight metallic lustre, except the abdomen, which is almost colourless except for the bars of the scent-glands and the connexival spots.

Life-cycle. The above larvae must evidently have been hatched for the most part late in July ; they matured at the end of August and during the early part of September in that late season ; but usually the imago may be met with earlier in August. It has also been found in May and June, in the latter month *in cop.*, and these would no doubt be over-wintered specimens, so that here again we have every probability that the species hibernates ; the eggs would probably be laid early in July. The records for the capture of the adult are continuous from May to October.

Habitat, etc. *E. melanocephalus* is a gregarious insect, usually rare, but occasionally occurring in considerable numbers ; in such cases they may easily be picked off the food-plants. These are *Stachys sylvatica*, *Eremostachys laciniata*, *Galeopsis tetrahit*, *Clinopodium vulgare*, *Lamium album*, and *Scrophularia*. All these except the last are labiate plants, and therefore the variety is not so great as it might at first seem to be. There is no doubt, however, that *Stachys sylvatica* is to be considered as the normal food-plant. The bugs are usually taken by sweeping, and their occurrence other than sporadically is apparently periodical. In the year 1903 the species seems to have been particularly plentiful, not only as above, but also in the experience of Messrs. Kirkaldy and H. J. Turner at Horsley in Surrey. At this place also a number of specimens were taken in 1900 ("Pr. S. Lond. Ent. Soc.", pp. 16, 81). The only previous record of any considerable numbers is 1877, when it was locally common at Hawkhurst, Kent.

The captures of this species at Horsley in 1903 were made on June 6th, when two specimens were found *in cop.* as well as a number of separate examples. The food-plant was, as usual, *Stachys sylvatica*. In his report Mr. Kirkaldy refers to Lethierry's statement in his "Revue des Hemiptères de Belgique," that *E. melanocephalus* is found "Partout sur *Stachys sylvatica*." Bucaille, however, in his "Catalogue des Hemiptères du Département de la Seine-inférieure" ("Bull. Soc. an. des Sci. Nat. de Rouen," 1887) records it as occurring on lucerne and nettles. So far as the second of these plants is concerned, Kirkaldy thought there might be some mistake, as it is quite usual for nettles and *Stachys* to grow together, at least in this country. He thought also that the mature bugs lie concealed in the flower heads and under the leaves of the *Stachys*, coming out on the upper parts during bright sunshine. Mr. H. F. Fryer tells me that he has taken this species on *Ballota* only.

Distribution. Though occurring throughout the greater part of the Palaearctic Region, this insect occupies only a very restricted area in Britain. It has been recorded from five counties south of the Thames, viz. Kent, Surrey, Hants, Berks, and Somerset, and outside this area there is only one record, viz. from Whittlesea in Cambs, by Blatch.

19. **Eusarcoris aeneus** Scop.

Scop. Ent. Carn. 122, 358 (1763) ; D. & S., B.H. 76 (1865) ; Saund., H.H.B.I. 26 (1892).

Ova. Of the egg of this species I have no knowledge.

Larvae. A larva taken by Mr. Ashdown in the New Forest was as follows: Short, broad, and strongly convex, with black puncturation; head large, convex, central lobe extending as far as side lobes, sutures black; pronotum trapezoidal, transverse, much wider behind, lateral margins serrate, anterior two-thirds ochreous, impunctate, disc with two transverse black lines, one on each side, posterior angles slightly swollen; scutellum with unpunctured ochreous spot on each side at base, bounded outwardly by a black spot; wing-pads short; a pale line down centre of pronotum and scutellum; connexivum with an arcuate line of black punctures to each segment, sutures reddish; first pair of scent-glands consisting of an ochreous point on each side, surrounded with black; second pair of a pentagonal area marked off by a black line, and with a large ochreous spot on each side; legs ochreous with last joint of tarsi black, femora with black rings, tibiae angular, inwardly black at apex; antennae four-jointed, basal joint short, ochreous, black at base, second joint ochreous, slenderest and longest; third more or less black; fourth black, longer than third; rostrum ochreous at base, black at apex; the head is not black as in the imago.

Life-cycle. In August I could get no imagines till the end of the month. They are, however, sometimes found also in May, June, and July, and these are probably over-wintered specimens; but more information on the life-history is much to be desired.

Habitat, etc. Like the preceding, it is obtained by sweeping. It has been recorded from various food-plants, such as *Leonurus*, *Marrubium*, *Trifolium* (various species), *Fragaria*, *Rosa canina*. But in Britain it is usually obtained by sweeping in grassy places in young plantations; I have taken it also by sweeping in a heathy place. It has been found stored as prey in the nests of the spider *Theridium sisyphium*. (Verhoeff, 2.)

Distribution. It is distributed throughout Europe, Siberia and the greater part of Palaearctic North Africa, but in this country it is almost entirely restricted to one small area, the New Forest. The only other record is from Faversham, Kent (Walker), and there is a specimen in the Power collection labelled Tilgate (Sussex).

20. **Peribalus vernalis** Wolff.

Wolff., Ic. Cim. 141, 135, t. 14, fig. 135 (1800); D. & S., B.H. 82 (1865); Saund., H.H.B.I. 27 (1892).

Ova and **Larvae.** Of the early stages of this insect nothing seems to be recorded.

Life-cycle. Including continental records, the imago has been met with from April to September, inclusive.

Habitat, etc. Up to this point all the insects we have considered have been more or less completely ground-dwellers, or dwellers upon flowers or grass-stems, and they were to be obtained by searching at the roots of plants or by sweeping. Now a different method has to be employed, for this and several of the *Pentatomidae* that follow it are mainly inhabitants of forest trees, and have to be sought for by beating. We have then in these species Hemiptera which live at a greater distance from the ground, and whose outlook must, therefore, on the whole be very different. The present species has been taken on birch, oak, hazel, white poplar, pines, and juniper; but it has also been recorded from a few low plants, such as *Verbascum*, *Epilobium*, and *Umbelliferae.* Flor gives "on grass on dry hillsides." It is a very variable species.

Distribution. This insect, though distributed throughout almost the whole of the Palaearctic Province, and common on the Continent, is exceedingly rare in Britain, so much so that the individual captures must be enumerated. E. Saunders possessed two specimens, one from the Crotch collection, and labelled Weston-super-Mare, and one from the Harding collection without locality label. Douglas and Scott (1) refer to Crotch's specimen and another without locality. Marshall records it from Borrowdale in Cumberland. Thus these records give only two fully authenticated specimens. In addition to these, Guermonprez took one in Slindon Woods, W. Sussex, on hazel, September 13th, 1899. Notwithstanding diligent search, no others could be found. On May 25th, 1901, Morley (4) took a specimen on a young white poplar in Bentley Woods, near Ipswich, beaten in the afternoon about three o'clock on a warm, windless day. This specimen, through Mr. Morley's kindness, is now in my collection. On August 12th, 1902, another specimen was taken at Huntingfield, Faversham, Kent, by Mr. A. J. Chitty. Its captor suggested that the very ordinary appearance of this bug may lead to its being overlooked, and that it may not be really so rare as the paucity of records makes it appear. Two other specimens have been taken in Devonshire, near Totnes, one on May 23rd, 1918, and the other on September 19th, 1915, by the Messrs. Edmonds. Thus seven British specimens are known from districts as wide apart as Suffolk, E. Kent, W. Sussex, Somerset, Devon, and Cumberland, together with one or two others without localities attached. This sporadic distribution is certainly remarkable and not easy to be understood.

21. **Carpocoris fuscispina** Boh.

Boh., Vet. Ak. Hand. lxx, 241 (1849); D. & S., B.H. 78 (1865) (Pentatoma nigricorne); Saund., H.H.B.I. 27 (1892).

This insect, so common abroad, and so rare with us, is quite a classic species, and has been more fully studied than almost any other Pentatomid.

Ova. These are ellipsoidal, with a lid consisting of a segment of a sphere of much larger radius, and therefore flatter than the rest of the surface.

Both the body of the egg and the lid itself are covered with a delicate network of fine blackish veins. But round the margin of the operculum runs a narrow white band, not reticulated. The eggs are set up on their rounded ends in rows like skittles, but touching one another, and to the number, according to De Geer, of about twenty-eight. Fabre, however, speaks of much larger batches as laid in captivity, and this, of course, may have resulted from the absence of any such disturbing circumstances as might, in the open, have prevented the mother from completing her task in one spot. At the end of April, Fabre secured a number of couples of the perfect insects, and enclosed them separately in glass-topped boxes, supplying them with sprigs of rosemary, which were daily renewed, and placing them where they could get plenty of sunshine. In this way he succeeded in obtaining numerous batches of eggs, the largest containing nine rows of about a dozen each, the total thus being about one hundred. Usually, however, they were much less numerous, ranging from twenty to fifty. Of course, the smaller numbers might be explained on the hypothesis that other batches had already been laid elsewhere, before the insects were captured. Shortly before the time of hatching, a dark mark is seen through the egg-shell, near the top of the egg and on one side; this is afterwards discovered to be a trifurcate chitinous apparatus with its three rays connected by colourless membranes; it is used for lifting the operculum when the insect escapes, and remains within the egg-shell when its occupant has gone. At the time of disclosure, a vesicle is formed on the head of the imprisoned bug, by the pressure caused by a flow of blood against the soft skin of the head, just as takes place with Diptera belonging to the family *Muscidae,* in similar circumstances. By the pressure of this and the trifurcate apparatus already mentioned, which is placed above it and acts as a cutter, the operculum is forced up on one side, remaining pivoted on the opposite one, and kept in position by the trifurcate "egg-opener" until the insect has escaped, when it falls back again into position. When the operculum is lifted, the margin of the opening is seen to be finely denticulated. (J. H. Fabre, "Souv. Ent." viii).

De Geer figures a batch of ova laid on the sepals of a flower of *Geum urbanum*, but he adds that they are laid on leaves as well.

Larvae. De Geer has the following description of the larva in its first instar: Outline of body almost circular, slightly longer than broad, flat beneath and convex above, but much less thick than broad; in profile the contour of the upper surface is a continuous curve, there being no depression at the junction of the segments; head large and very broad, almost as broad as the body; antennae long and thick, with four joints, the apical one being the longest and thickest, and conical at the tip; thorax as broad as abdomen, head and thorax together forming half the length of the body; head and thorax shining black and abdomen whitish or yellowish-grey, the latter with a series of shining black fasciae placed dorsally, and on each side a row of similar but smaller spots; rostrum black, long and thick, extending beyond the posterior coxae; legs also long and thick; they and the antennae are blackish-brown; tarsal claws with two fleshy pulvilli as large as themselves; the whole body pilose.

I have not been able to find any description of the later instars.

Life-cycle. The eggs are laid in the early part of May, and hatch by the end of the month, according to Fabre, but De Geer says his batch hatched all together on the 21st of June. The imago is produced in August, and including continental records, has been taken from April to September. It hibernates in retirement, appearing again in April and May, when copulation takes place.

Habitat, etc. On the Continent this bug is found chiefly on flowers, such as *Centaurea*, *Carduus*, *Senecio*, *Artemisia*, *Cirsium*, *Geum*, *Verbascum*, *Eryngium amethystinum*, and *Umbelliferae*, but it is also recorded from young oaks and *Viburnum lantana*, and hence should be sought for by beating and sweeping. Mulsant and Rey describe it as occurring on the berries of small trees, and on corn as well as other plants. Frey Gessner says that it feeds upon caterpillars, and Judeich-Nitsche speaks of it as carnivorous.

This is one of the species both described and figured by De Geer in his "Mémoires pour servir, etc.," Vol. III. Poujade describes and figures its attitude during flight in "Ann. Soc. Ent. Fr." for 1884, and Gross gives histological details of amitosis in "Zeit. Wiss. Zool." for 1900.

Distribution. *C. fuscispina* is a very widely diffused species, extending throughout the Palaearctic Region from Western Europe to Japan, and descending to the north coast of Africa, and in Asia as far south as the Punjab. But, though common on the Continent it seems to have left the British Isles severely alone. It belongs almost entirely to Devonshire, where six specimens are known to have been taken at different times. The only other records are from Cornwall and the N. Essex coast, in which latter locality Harwood (1) took one on August 12th, 1901. This leads one to hope that it is not yet extinct in Britain, though certainly nearly so.

22. **Dolycoris baccarum** L.

Lin., F.S. 928 (1761); D. & S., B.H. 80 (1865); Saund., H.H.B.I. 28 (1892).

Ova. Xambeu describes the egg thus: "Long, 1.2 mm.; diam., 0.7 mm. Court, ovoïde, blanchâtre, quelques uns à fond rougeâtre, lisse et luisant, sans traces apparents de stries ou de rides, arrondi à l'un des pôles, subdéprimé au pôle opposé, à coquille assez résistante. Oeufs assez gros, proportionné à la taille de la mère, pondus au nombre d'une trentaine environ, et dont l'éclosion a lieu une douzaine de jours après, donnant la vie à un être mou jaunâtre."

Fabre describes them as dirty yellowish-white and barrel-shaped, with oval base, and adds that they are at first opaque, but that when they are hatched, the shell appears translucid and white or delicately rosy. The batches are large, from fifty to one hundred having been found. Fabre speaks also, however, of batches of not more than fifteen.

Larvae. I have taken the larva amongst *Ononis*, as well as by hedgeside sweeping. Like the imago, it is pubescent all over, but much more conspicuously so, and it may thus be easily recognised, although there is not much in its general appearance, apart from this, to suggest its identity; it is the only one of the Pentatomina we possess that is strongly pilose in all its stages. I do not know the youngest larva, but when about half-grown, 4¼ mm., it is oval in outline, though the regularity of the shape is rather interrupted by the head, which is proportionately large and prominent; the upper surface is not very convex. It is of an ochreous colour and thickly covered with black punctures, which with the pubescence give it a dull appearance; there are some large spots, rather darker, at the outer margins of the abdominal segments; legs and antennae pale, with the last joint of the latter and the tarsi darker; a few black markings on the scent-glands and at the sides of the thorax; lateral margins of pronotum gently rounded.

Last instar, 6½ mm. Fore parts all very dark through the close proximity of the very numerous black punctures, and sometimes slightly tinged with greenish; abdomen reddish ochreous with black punctures; outer margins of segments very broadly dark, and a few dark bronzy bars in the centre of the dorsal surface in the region of the scent-glands; ground colour of legs ochreous, but appearing almost black by reason of the numerous black punctures; antennae black; wing-pads dull and shagreened, and extending a little beyond second abdominal segment; antennae four-jointed; tarsi two-jointed.

De Geer has a description of the nymph, with which the above tallies in all essential details.

Life-cycle. As usual, the imago appears in August, although I have found specimens still larval in that month. I have records for the imago in all the months from April to October inclusive, but those in the earlier months are over-wintered examples, as it hibernates in the imaginal condition (see below). According to Xambeu, it takes about two months to pass through its larval stages, and copulation takes place towards the end of May.

Habitat, etc. This insect is taken chiefly by sweeping as it frequents low plants far more extensively than trees, on which, indeed, it is scarcely ever found. Over-wintered specimens should be sought for in April at the roots of various plants. It has been taken on *Fragaria*, *Carduus*, and other Compositae, *Geum*, *Hyoscyamus niger*, *Lamium album*, *Verbascum thapsus*, *Achillea millefolia*, *Hesperis*, *Ononis*, *Ulex*, *Juniperus*, *Crataegus oxyacantha*, *Prunus spinosa*, *Umbelliferae*, broom and brambles. In reference to the *Prunus*, it is called the "Sloe-bug" by the country people in Sussex. In the Scilly Is. J. E. Mason observed it commonly on the tree mallow (*Lavatera arborea*). De Geer says it is found in Sweden on raspberries, to which it imparts a nauseous odour, and Wolff, enlarging on this, gives "in baccis autumno, quas foedo inquinat odore, pueris invisus." De Geer further adds that it is found abundantly on the flowers of *Verbascum*, of which it sucks the juices. In winter it has been found taking refuge on juniper (Reuter, 19). This great variety of so-called "food-plants" seems to suggest an animal diet, the food consisting of the insect and arachnid denizens of those plants rather than of the plants themselves. It will be observed that the plants are all such as have showy flowers, and these would, of course, be attractive to other insects. There is, it would seem, another possibility, viz. that the bug is fond of sweets, and so frequents the flowers for the sake of their honey. Geoffroy, however, says that it lives on other insects, including Coleoptera, and Bechstein that it lives on Aphides. Schumacher, however, says that in his experience all the *Pentatomidae*, except the *Asopidina*, are phytophagous.

The male of this insect has been found serving as prey to a species of Asilid fly, *Laphria gilva* L. The fly, a female, was *in coitu* when captured, and was, in that condition, devouring the bug ("Proc. Ent. Soc. Lond.," 1908, p. xxxiii).

In copulation the bugs are usually found tail-to-tail, the smaller ♂ being dragged along by the ♀; but this is probably a secondary position, the original being with the ♂ above the ♀ as usual. Sometimes this insect occurs in very great numbers, e.g. Willoughby Ellis reported to the Birmingham Ent. Soc. that in 1900 it occurred in hundreds in the neighbourhood of Stroud.

Distribution. *D. baccarum* is one of the most widely distributed of the *Pentatomidae* we possess, being recorded from the whole of the Palaearctic Province, together with N. India, and according to Oshanin, N. America. In this country it has been recorded from all the coast counties from Norfolk southwards and westwards to Glo'ster, as well as from Northumberland, Cumberland, Leicester, Worcester, Wilts, Berks, and Surrey, and in Wales from Merioneth, Pembroke, Glamorgan, and the sandhills of Carmarthenshire. It is recorded also from the Scilly Is. and the Isle of Man, and from both Scotland and Ireland. It is common also in the Channel Is. Undoubtedly its distribution in the British Isles is quite general.

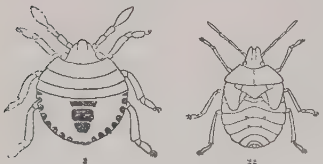
23. **Palomena prasina** L.

Lin., F.S. 249, 931 (1761); D. & S., B.H. 83 (1865) (Pentatoma dissimile); Saund., H.H.B.I. 29 (1892).

Ova. These are of the usual barrel shape; they are covered with an extremely fine irregular network of polygonal meshes in slight relief, and are of a delicate emerald-green colour. They have a circle of very short fine white globe-tipped setae just outside the cap. A few days before hatching the egg-cutter which is used in opening the egg appears plainly through the skin as a black T with two fine lines connecting the extremities of the arms with the base of the central upright; the eyes also appear as two rather large red dots beneath this. After hatching the egg-shell is first colourless but ultimately becomes dull white. A batch which was sent me by Mr. H. Main contained twenty eggs, laid in four rows in close contact with one another, and those in each row placed alternately to those in the preceding. According to Fabre, the batches usually consist of about thirty, but as he describes the eggs as brown, I am inclined to think he must be referring to a different, though no doubt allied, species. When the eggs are infertile, they retain their green colour.

Larvae. Like the imagines, the larvae, in all but the earliest instars, are entirely dull green, thickly punctured with black, and with lateral margins of pronotum and abdomen, the eyes, the openings of the scent-glands, and the tarsi yellow, and the last two antennal joints reddish.

The newly hatched larvae, measuring 1 to 1¾ mm. in length, are circular in outline, green at first, but afterwards have the fore parts black and the abdomen pinkish with black spots on the connexivum and black bars in the region of the scent-glands; antennae and legs black.



Larvae of *Palomena prasina* L.
i 1st instar. ii Last instar.

2nd instar, 3 mm. Head black except two streaks on the side lobes, which are green; the three thoracic segments with a large black patch on each side, occupying the greater part of the disc; a thin transverse fascia at base of abdomen, two broad bars in the region of the scent-glands, followed by a short and very narrow one, a semi-circular spot at the lateral margin of each abdominal segment, and the legs and antennae black.

3rd instar, 5 mm. The black is reduced to a band along each side of the central lobe of the head, the extreme margins of the head, thorax, and abdomen, the abdominal bars, the connexival spots and the antennae.

The fourth and fifth instars are as above described, entirely green; the connexival spots disappear, and there is round the abdomen merely a narrow yellow band bounded outwardly by a thin black line. There are slight incisions on the margin at the junction of the segments.

The exuviae, especially those from the last larval moults, are very beautiful objects, of a yellowish-white colour, thickly covered with black punctures, and they may be profitably used for the study of the structure of the chitinous exoskeleton, since every part stands out perfectly clear and distinct. As the casing of the abdomen is more flexible than that of the other parts it shrinks a good deal after the insect has withdrawn itself, while the other parts retain their natural form. No pigment is contained in the skin except in its punctures, which all appear most distinctly black. Thus it appears that the coloration of this bug, so far as ground colour is concerned, lies beneath the cuticle, while the colour of the puncturation lies in the cuticle itself. The casings of the mouth organs, the antennae, and the legs are perfect in the exuviae, even to the smallest claw or hair. The ecdysis is accomplished in the manner described under *Piezodorus lituratus* (q.v.). As in previous species, there are only four joints to the antennae and two to the tarsi in the larvae.

Life-cycle. *P. prasina* matures somewhat later than the rest of the *Pentatomidae*, and the insects of the year can rarely be found in the imaginal form before September. The larvae are often abundant throughout August by sweeping on hedgebanks, by roadsides, or on open grassy and flowery spaces. To judge from the difference between the number of larvae and of adults to be obtained, there must be considerable mortality in the early stages notwithstanding its resemblance to vegetation and its strong odour. The imago evidently hibernates, as I have taken it in June, which is certainly far too early for the insects of the year ; including reports from the Continent the records are continuous from April to October, and it has also been taken in January.

Habitat, etc. It is usually taken by sweeping. Parfitt found it in Devon on raspberries, to which it gives a most disagreeable odour and taste ; Morley records it from Suffolk on poplar and birch, and Jennings from Tring on hazel. In Paget's "Yarmouth" it is said to have been very common in the neighbourhood of that town on firs. Nothing is said, however, as to the time of year, and it is well known that a large variety of species, both of Heteroptera and Homoptera, take refuge in coniferous trees during the winter, when their evergreen condition affords a shelter which could not be obtained from deciduous trees, and when most of the herbaceous "food-plants" have died away. It has been found also on many other trees, shrubs, and herbaceous plants, as the following list will show : *Betula, Populus tremula, Fagus, Tilia, Ailanthus, Corylus, Euonymus, Quercus, Syringa, Rubus, Asparagus,* Red Valerian (*Centranthus ruber*), *Prunus, Crataegus, Umbelliferae, Graminaceae.* Wolff says it feeds on caterpillars.

According to Ashmead, it is preyed upon by the fossorial Hymenopteron *Astata boops*, and is itself apparently parasitised by some species of Diptera, for Pissot has the following observation : "Au mois de juillet, je vis une *Pentatoma dissimilis* (=*prasina* L.) se poser sur une feuille de framboisier. Presque aussitôt j'aperçus une substance blanche paraissant lui sortir de l'anus en s'agitant. Cette substance s'allongea par une mouvement vermiforme, et quelques instants après s'être détaché de la *Pentatoma*, elle se mit à ramper sur la feuille de framboisier. Je crus alors reconnaître une larve de Diptère ; mais elle roula sur la feuille et tomba, and je ne pus la retrouver sur la terre couverte de feuilles et d'herbages. Cependant, j'avais eu le temps de reconnaître sa forme et sa taille. Elle avait environ un centimètre de long sur environ quatre millimètres de large. Elle était pointue en avant, large et tronquée carrément en arrière. Elle avançait par un mouvement imprimé de côté au corps, comme le font les larves apodes. Il est probable qu'elle s'enfonça dans la terre humide pour y subir sa transformation en insecte parfait. Quant à la *Pentatoma*, elle resta très longtemps immobile sur la feuille où elle s'était posée, et je l'ai vue dans cette immobilité pendant plus d'une heure. Le larve avait au moins un volume égal en tiers de celui de la *Pentatoma*."

A brownish or dark olive variety is occasionally found ; Willoughby Ellis took this form in some numbers on ivy at Torquay, May 25th, 1907, and Schumacher reports that it is common in Germany.

Distribution. *P. prasina* is found throughout the greater part of the Palaearctic Region, European, African, and Asiatic, and is also widely distributed in Britain. It has been recorded from all the coast counties from Northumberland round to Somerset, except Lincs, as well as from Northants, Oxon, Middlesex, Surrey, and Berks, and in Wales from Glamorgan, Merioneth, and Carnarvon. It is also recorded from Ireland, but not from Scotland. The record from Yorkshire is doubtful.

24. **Chlorochroa juniperina** L.

Lin., F.S. 249, 930 (1761) ; D. & S., B.H. 81 (1865) ; Saund., H.H.B.I. 28 (1892).

Ova and **Larvae.** Of the early stages of this insect I know nothing.

Life-cycle. Like the majority, if not all, of the rest of our *Pentatomidae*, *C. juniperina* hibernates, in some cases in the moss under juniper bushes, and sometimes on the bushes themselves. Mr. and Mrs. J. Scott, on a warm day in March, viz. 26th March, 1873, found twenty-four specimens on the bushes, after searching in vain for a long time amongst the moss at the roots. Douglas, however, had found it in the moss in the March of two years earlier. In addition to these, there are records of its occurrence in April, June, July, August, and October.

Habitat, etc. As a rule it spends the greater part of its life on juniper bushes, finding sustenance possibly from the juices of the shrubs themselves, although this does not necessarily follow. But a specimen was beaten by Kidson Taylor from either hazel or blackthorn in Miller's Dale, Buxton, where no juniper seems to grow. It has been found on the Continent on *Salix* (Reuter), Peaches, *Opuntia humifusa*, grasses, as well as on three species of juniper, *Juniperus communis*, *J. sabina*, and *J. subrotundata*. In winter it has been found also on *Pinus sylvestris* (Reuter, 19). Wolff also gives pines. Dalla Torre gives *Corylus* and *Alnus* as shelters.

Distribution. It inhabits most parts of the Palaearctic and Nearctic Provinces, especially the more northern parts, although it extends as far south as Algeria. In Britain it is now exceedingly scarce, and is almost confined to Surrey, where it was formerly taken in some numbers on the junipers of Sanderstead, Caterham, and Mickleham. There is a specimen in the Power Collection from Tunbridge Wells, and the only other records are from Derbyshire as above, and from Northumberland, Notts and Leicestershire. As the juniper is a widely distributed shrub, and grows more commonly in the northern parts of our Islands, it is rather strange that this species occupies such a restricted area, and belongs chiefly to so southerly a county as Surrey, especially as on the Continent it has been found as far north as 66°. It is not recorded from either Wales, Scotland, or Ireland.

25. **Piezodorus lituratus** Fabr.

Fab., E.S. iv. 114 (1794) ; D. & S., B.H. 100 (1865) (purpuripennis) ; Saund., H.H.B.I. 31 (1892).

Ova. In almost every instance that has come under my notice, the eggs have been laid on the young and unopened, but fully-formed, flower-buds of the furze (*Ulex europaeus*), being placed in a double row along one of the two sepals. Each group contains from eleven to fourteen eggs, placed in two contiguous rows; those in each row are in close contact with one another, and are placed alternately to those in the other ; when there is an odd egg it is set in the middle line at one end. The egg is a drum-shaped body, consisting of a short cylinder rounded at the end which is attached to the flower, and somewhat flattened at the other, where it is closed by a kind of lid. The whole surface is banded alternately with rings of white and nigro-fuscous, a white spot forming the centre of the distal extremity, and a dark one that of the proximal, while the sides show two white and two dark bands. The surface is reticulated and beset all over with fine whitish spines ; and further, the white band round the apical rim carries a series of about thirty large white spines, which are strongly clavate and nearly erect. The circular lid is of the same texture as the rest of the shell, and is white, with a not very clearly defined nigro-fuscous ring on its disc.

On hatching, this cap is pushed up on one side, remaining attached at the opposite point, so that after the emergence of the larva it falls back almost into its original position. It does not, however, quite close the aperture, because there usually projects the curious apparatus which has been well described by J. H. Fabre in connexion with another species (" Souv. Ent.," viii, 69). This consists of a clear membrane with three strong brownish ribs radiating from one point on its margin, like the webbed foot of a duck. According to Fabre, this apparatus is general in the *Pentatomidae*, and is used in conjunction with the forcing of blood into a trihedral vesicle on the head, as a spring to push open the lid of the egg ; and it remains, after the emergence of the insect, projecting through the opening, and preventing the lid from being completely shut. I understand from Mr. F. Muir that in the *Pentatomidae* this egg-opener acts, not merely by pushing the lid off, but also by actually cutting through the chorion.

Larvae. The larvae when newly hatched are entirely of an orange colour, with red eyes and a red patch on the dorsum of the abdomen. After about an hour the colour changes to pale brown on the fore parts, with three similarly coloured bars in the region of the scent-glands, and spots on the connexivum. Ultimately the fore parts, the abdominal bars, and the connexival spots become black, and the abdomen may remain more or less orange, or deepen into crimson, while the legs and antennae become dark piceous, the eyes still remaining red. Antennae four-jointed, with terminal joint much the largest, and first and third sub-equal and smallest; tibiae strongly ridged, tarsi two-jointed, with the terminal joint much the longer; claws strongly curved, and pale in colour; central lobe of head projecting considerably beyond side lobes; head and thoracic segments shining and almost impunctate, but with fine transverse striae; the first two thoracic segments sub-equal in length and the third shorter.

In the second instar the colours and general form are pretty much the same, save that the antennae are darker, almost black, but the base and apex of the second and third joints have a pinkish tinge, as also the apex of the first and the base of the fourth. The whole insect has now become strongly and densely punctuate, and the punctures on the red part of the abdomen, being black, are very conspicuous. The fore parts still retain some transverse striations, with a small patch on the vertex alutaceous; head still very large in proportion to body, and pronotum rather longer than mesonotum.

There are in all five larval instars, and the changes that take place concurrently with the growth of the insect consist chiefly in modifications of the thoracic segments. In the third instar, the middle of the hind margin of the mesonotum is slightly extended backwards, so that the margin becomes gently sinuate, and this segment begins dorsally to overlap the metanotum slightly in the centre. This sinuation is still more pronounced in the fourth instar, by the increase in the length of the mesonotum in the centre and at the lateral margins, so that still less of the metanotum remains visible. At the same time the lateral margins of both pro- and mesonotum become narrowly ochraceous. In the fifth and last larval instar, the wing-pads are fully developed, the mesonotum projecting in the centre in the form of a large triangle (the rudimentary scutellum), and at each side as a large flat disc rounded outwardly and truncate behind, representing the hemielytra of the adult. Beneath this, and forming a continuation of the metanotum, appears a corresponding disc representing the wings: the metanotum itself also is by this time triangularly produced in the centre.

The only other changes are that hairs appear on the inner margin of the tibiae, which become longer at each ecdysis ; the basal tarsal joint also becomes very hirsute beneath, and the terminal one less so ; the antennae also develop hairs. The puncturation of the fore parts becomes more rugose as growth proceeds. The claws in the last instar are appendiculate and very strong. Most of the bright red colour has disappeared from the abdomen by the time of the last instar, and has been replaced by a vinous tint. There are no ocelli in any of the larval instars, and the number of antennal joints remains four throughout, and that of the tarsal joints two. Clearly, therefore, the greatest number of morphological changes occur at the last ecdysis, when the insect acquires its wings and ocelli, and increases the number of its antennal joints to five, and of its tarsal joints to three, while at the same time the reproductive organs are perfected and the integument becomes strongly chitinised. The openings of the scent-glands are at the same time transferred from the upper to the under surface.

There is a green form of the larva, besides the one above described, and this probably corresponds with the green form of the adult. Some change takes place in the distribution of the pigment during larval life, for a cast skin of the third instar shows almost as much colour as the insect itself, and those of the first are quite black, except the abdomen, which is hyaline ; but one yielded by the last instar is entirely pale ochreous, with a fine rosy tinge on the wing-pads ; and the black punctures show out very distinctly, indicating that the pigment in them is entirely superficial. The legs in this specimen are ochreous, with blackish tarsi, and the space between the dark bars of the scent-glands is snow-white.

At each ecdysis the skin splits longitudinally along the middle line of the pro-, meso-, and metanotum, and also transversely along the suture between the head and pronotum, so that the cephalic sclerite remains entire, bent forward to the front of the cast skin, the part covering the eyes being separated from it at the sides, while the halves of the dorsal sclerites of the thorax are pushed towards the sides quite free from the head, but remaining attached to the abdominal skin behind, which does not split anywhere. Not only are the limbs and antennae drawn out of their sheaths, but also the rostrum and its setae, and the principal tracheae, especially those that spring from the spiracles. This method of ecdysis holds good for all the *Pentatomidae* in which I have been able to observe it. It may here be remarked that the cast skins form excellent objects for observing the structure of the exoskeleton.

Life-cycle. Mr. T. Edmonds, of Totnes, kindly sent me several batches of eggs on May 20th, 1916. One of these batches began to hatch out on June 3rd, and most of the batch emerged on the same day, the greater number of them at exactly the same time. They emerge with the dorsal surface uppermost, and the legs are drawn out last of all. They were fed on furze, but the weather was very cold at the time and their growth was correspondingly slow. The first ecdysis did not take place till June 18th, and during the whole of the fortnight of their free existence they had persisted in clustering together in a corner of the box in which they were kept, and quite away from the food-plant; they would remain in this position for days together, quite inactive. At first they were very reluctant to leave the empty egg-shells, clustering on top of them for hours at a time, without moving, and not attempting to reach the fresh food-plant which was close by.

I was unable to carry these insects beyond their second instar, and can only speak of the rest of the life-history from examples found at other times.

Adult insects may be found throughout the year; in fact, I have records of captures in every month except February. Copulation takes place in the spring and the ♂ shortly afterwards dies. The ♀ begins to deposit her eggs almost immediately, and the fact that they are placed on the furze flower-buds is good evidence of the time of their deposition. The larvae appear during the summer and generally mature by the beginning of August; but some may still be found during the rest of the month, and a few stragglers even up to the beginning of October. This seems to imply that batches of eggs are laid at intervals during the summer, as we have seen that those of the same batch are hatched almost simultaneously. The normal time for completing the larval life seems to be about two months. The insects of the year usually spend the winter in the furze-bushes, the evergreen nature of which affords them the needful shelter.

Habitat, etc. *Piezodorus lituratus* is one of the commonest of our British *Pentatomidae*, and is found on furze bushes in most places where these flourish; on these it spends its whole life, and may be met with in all its stages. The Rev. W. F. Johnson (2) gives the following particulars of its winter life: "On October 18th, on a fine, bright morning, I found the gorse occupied by numbers of these insects, and extending my observations to other parts of my farm, I found them in numbers on almost every furze bush I examined, and on this occasion I met with the larva also. I thought, of course, that I had seen the last of *Piezodorus*, for a day or two afterwards I went back to the place, and could not see one. However, on November 17th the sun was shining brightly on the southern side of the hedge, and there were the insects basking in the genial beams, and I again met with the larva. I should mention that though the south side of the hedge was bright and warm, the other side was quite the reverse, for there was a keen north wind blowing. I have yet another appearance to record. This morning, December 6th, between 11 a.m. and 12 noon, I was walking past the hedge and thought I would take a look for my insect friends, and sure enough there they were sitting in the snuggest and sunniest corners and getting as much of a sun-bath as they could." On January 20th Mr. Johnson writes: "The insect has been about all through the winter up to the present date. Every day that there is a little sunshine it comes out of its retreat. Yesterday was bright, though there was snow on the ground, and there were the insects sitting on the gorse in sheltered corners in the sunshine."

Piezodorus is, of course, usually captured by beating furze bushes. When plentiful, they might be picked off the bushes if they could easily be seen. But this is not the case. Mr. Johnson says again: "They harmonize well with the colour of the gorse, for I wanted to show them to my man, and until I put my insect forceps upon them, he did not see them, and he told me that, had I not pointed them out, he would never have noticed them, and he is by no means unobservant." The insects rest with antennae sloping slightly backwards and outwards. In hot weather they readily take wing, and fly with a loud buzzing noise.

Though the insect has its abode on furze bushes, it does not follow that the plant constitutes its main food. Xambeu, it is true, records that the newly hatched bugs at once plunge their rostra into the plant and proceed to suck its juices, and the first food is undoubtedly gorse juice, as I have confirmed with the above-mentioned larvae. But in their second instar these same larvae persistently refused to have anything to do with the furze with which they were kept supplied, and this is in accord with the experience of Mr. Johnson, who, speaking of somewhat older larvae, says: "These larvae were very badly behaved in captivity, for all that I took, except one, preferred to die rather than proceed to the perfect state, though I gave them every comfort, not to say luxury." I am inclined to think that a change of diet was needed in this second stage, and that, while the insects in their first instar readily fed on furze juice, they may have needed afterwards the stimulus of an animal diet. And such food could easily be obtained on furze bushes, for these are always thickly populated with insect and arachnid life of all sorts, much of which might quite easily be mastered by *Piezodorus* larvae in any of their stages.

It sometimes itself falls a prey to other *Pentatomidae.*

The eggs are subject to the attacks of a minute Hymenopterous parasite, a Proctotrupid of the genus *Telenomus.* The parasites do not appear till about three weeks after the time for the emergence of their hosts; and apparently their first meal after emergence consists of the lid of the egg, which entirely disappears without leaving any traces.

So far as I have been able to observe, when parasitism takes place, all the eggs in a batch are affected.

This insect is not absolutely confined to furze bushes; it has been found also on other leguminous plants, such as broom, *Genista*, *Melilotus*, and *Trifolium.* Other plants also, outside the *Leguminosae*, have yielded it, such as tamarisk (Tuck), willow (Sopp), heather (Bedwell), and Reuter (19) adds *Lonicera, Crataegus, Betula, Quercus*, and in winter on Pines. But, except the last, most of these are probably merely casual occurrences, and in this country at any rate, the staple host-plant is certainly *Ulex*.

Distribution. *P. lituratus* is found in Central and Southern Europe and in some other of the more southern parts of the Palaearctic Region. In this country it is one of our commonest species and probably occurs wherever the gorse grows abundantly. It is included in almost all published lists, and has been recorded from all the coast counties from Norfolk round to Glo'ster, as well as from Northumberland, Cumberland, Yorks, Lancs, Cheshire, Notts, Warwick, Oxon, Bucks, Herts, Surrey, Berks, and Wilts, and in Wales from Glamorgan, Carmarthen, and Carnarvon. Norman records it from Scotland, J. E. Mason from the Isle of Man, and Johnson and others from Ireland. Buchanan White says, " It is not an uncommon species in the lowland parts of Scotland. The most northerly locality from which I have specimens is Forres (Norman)." (" Scot. Nat." I, p. 264.)

26. **Pentatoma rufipes** L.

Lin., S.N. i. 719, 24 (1767) ; D. & S., B.H. 98 (1865) ; Saund., H.H.B.I. 32 (1892).

Ova. On August 24th, 1917, I found in the New Forest a batch of fourteen eggs attached to an oak leaf. They hatched early in September and turned out to be this species. The egg is spheroidal, of a yellowish colour, with a single red mark at the upper extremity, near to which is a black mark somewhat T-shaped (this probably appears only a short time before hatching and is the egg-opener showing through) ; the surface is quite smooth, save for a circle of white points which bounds the rim where the cap is attached. After hatching, the chorion appears hyaline, shining and iridescent, while the red spot has disappeared and the black T-shaped mark shows itself as the trifurcate instrument which is used to open the lid or cap. The cap remains attached at one side and falls back into position after the emergence of the embryo. These fourteen eggs were arranged in four rows, the two outer ones containing three each, and the inner ones four ; the eggs in each row were in contact with one another, and with those of the preceding row, being placed alternately to these. Mr. H. Main has given me an exactly similar batch on a nut leaf.

Larvae. The larva can be recognised in all its instars by its ochreous colour marked with bronzy-black, and especially by the black arches that appear in the connexivum.

1st instar, 1½ mm. Head large, central lobe projecting beyond side lobes, bronzy-black except side lobes which are ochreous, more or less infuscated, deeply but not closely punctured except central lobe ; eyes red, touching pronotum ; pronotum ochreous with castaneous streaks and a central blackish patch traversed longitudinally by a thin ochreous line, transversely wrinkled in centre and with large scattered punctures, anterior and posterior margins much curved, anterior angles rounded ; mesonotum shorter than pronotum, bronzy-black and punctured, with central ochreous line ; metanotum shorter still, bronzy-black with an ochreous patch at each lateral margin ; abdomen with black punctures and whitish -pink margins to segments ; central bars in region of scent-glands, bronze-black, the first short and narrow, the second much longer and broader, the third an elongate somewhat pear-shaped patch ; connexivum with an arched black mark to each segment, the space beneath the arch ochreous ; antennae four-jointed, first black, second brownish, whitish at apex, third fuliginous, white at base and apex ; femora black, tibiae brownish ochreous with a faintly outlined whitish ring in centre, angular, outwardly sulcate ; tarsi two-jointed, ochreous, apical half of terminal joint black, claws ochreous ; underside greenish-white with margins of segments black in centre ; sternum black at sides, connexivum marked as on upper side.

2nd instar. Similar to above, but with three pairs of ochreous laevigate spots on the black area of the scent-glands, antennae almost entirely black, and the white rings on the tibiae distinct. The lateral margin of the pronotum is crenulate. Length 2¾ mm.

3rd instar. Length 4 mm. Entirely similar to above, except that the margin of the pronotum is not crenulate, but irregular.

4th instar. Length 7 mm. Similar to preceding, but with the ochreous parts darker and more reddish, and the femora and tibiae are mottled with ochreous and castaneous, so that the tibial rings have quite disappeared ; mesonotum doubly sinuate on hind margin, indicating scutellum and rudiments of wing-pads ; basal joint of antennae dark ochreous ; pro- and meso-notum dark reddish ochreous with irregular bronzy-black markings.

5th instar, 9–10 mm. The nymph is very handsome. In shape it is similar to the adult, with the hinder angles of the pronotum for the first time produced, although not so much as in the imago ; head, pronotum, and wing-pads bronze-black, mottled with reddish ochreous, which forms a large patch on each anterior angle of the pronotum, and one on the outer margin of each wing-pad ; scutellum also reddish ochreous deeply black-punctured ; abdomen ochreous, deeply black-punctured except between the black bars of the area of the scent-glands ; a pair of reddish ochreous laevigate spots in each of the three black bars ; connexivum with a black arch in each segment, otherwise ochreous ; legs ochreous with dark punctures and patches, tibiae channelled outwardly ; antennae black except first joint, which is ochreous ; underside pale ochreous, black-punctured, and with connexivum showing only the ends of the black arches ; rostrum ochreous, darker at the tip.

Life-cycle. This fine species occurs commonly as an imago from the end of June to October, and the only record outside those months is one for May 30th, 1917 (Edmonds). Probably the insects are most numerous in August. I have found recently matured specimens *in cop.* in August on birch trees ; but on opening the body of the ♀ I could find no trace of ova. The ova described above hatched early in September, and it would seem, therefore, from this and the absence of records of the adult during the winter that it must pass the winter in the larval condition, maturing in the following June. Larval specimens are commonly met with in late spring, confirming this conclusion (Walker, 8). If this be so, it gives a shorter imaginal life than in any other of our *Pentatomidae*, a life of not more than five months.

Habitat, etc. *P. rufipes* is an inhabitant of various trees, such as *Quercus*, *Alnus*, *Crataegus*, *Fraxinus*, *Betula*, *Fagus*, *Populus*, *Salix*, *Ulmus*, *Sorbus aucuparia*, and Apollo firs, but perhaps most commonly of oaks ; J. Sahlberg adds *Ribes* ; Prof. Carr reports it from flowers of *Senecio jacobaea*. It is sometimes found in gardens, and even in streets of towns, e.g. London, crawling on the pavement. This, no doubt, implies considerable powers of flight in order to travel so far from the sphere of its infancy. J. Edwards reports it as flying to light. Morley (4) records it from a seeding *Angelica* flower-head, and he also found one on a dead hawk. Whittaker speaks of taking it by beating chestnuts, and Collins by beating *Corylus*. If all the above mean diet, the ménu is certainly a very varied one. But as an imago this species has, for the last 140 years, been credited with carnivorous habits. De Geer says it wanders over the foliage of trees seeking caterpillars to suck, and several observers since his time have confirmed this statement. Wishing to determine whether the larva is characterised by a similar habit, I enclosed a specimen in its last instar, which I found on hawthorn in Epping Forest on June 15th, in a box with a twig of the host plant, and a well-grown Orthosiid larva from the same bush. For some time the bug seemed to leave the caterpillar severely alone ; but after a few days, when the caterpillar had eaten the greater part of the hawthorn provided, I was glad to see it and the bug in close contact, and I hoped that the latter had at last risen to the occasion and attacked its companion. But on looking more closely, I was surprised to find that, although the caterpillar was undermost, the tables had been turned, and it was the caterpillar that was devouring the bug ! Almost the whole of the underside was eaten away, and little more than the dorsal integument remained. I was familiar with the fact that some Orthosiid larvae will, when their natural food fails, show carnivorous tastes and attack other larvae ; but I was scarcely prepared to find an insect which is one of the most evil-smelling of our bugs made the object of attack. It is only fair to add that the disagreeable scent of the bug, which was at first very pronounced, had almost entirely passed off when the tragedy took place, and possibly this may have made the insect palatable.

Dalla Torre speaks of the imago as a destroyer of aphides, and Gorski

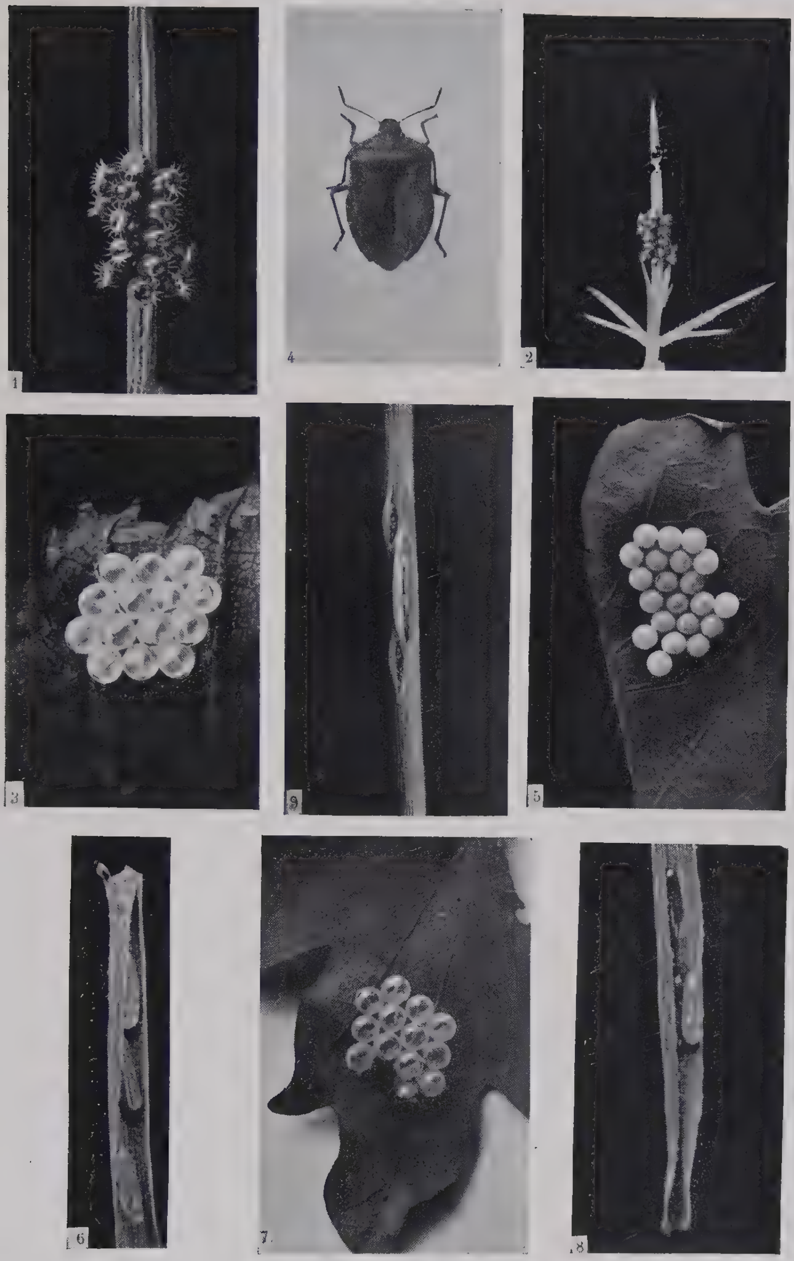


PLATE II.

1. Eggs of Troilus luridus F. 2. The same, less magnified. 3. Eggs of Pentatoma rufipes L. on nut leaf. 4. Palomena prasina L. adult. 5. Eggs of Palomena prasina L. on oak leaf. 6. Eggs of Berytus clavipes F. on grass. 7. Eggs of Pentatoma rufipes L. on oak leaf. 8. Eggs of Berytus clavipes F. on grass. 9. Eggs of Nabis (?) in Chlora stem, distorted.

H. Main, photo.

as pursuing and destroying the caterpillars of the gipsy moth (*Bombyx dispar*). On the other hand, Schumacher says he has often bred it, and has always found it to be phytophagous. I have seen larvae in the second instar sucking a sycamore leaf ; while doing this, the rostrum, which is very long, is thrust far forward, and the body is inclined at an angle of about 30° to the surface on which it is resting.

The odour from the scent-glands, which is most disagreeable, is compared by Frey Gessner to that of rotten apples, with a little muskiness. It can "inflict a painful probe with its powerful beak" (McGregor). It readily takes to flight. It has been found exhibiting a peculiar oligomery of the antennae, the normal fourth joint, in one instance, being suppressed, but the third elongated ; hence the antennae, being four- instead of five-jointed, preserved the larval structure, though with a lengthened segment. Another example had the terminal joint missing, the third short and thickened, and the fourth much elongated and slightly thickened (Douglas).

Distribution. *P. rufipes* occurs throughout the northern parts of the Palaearctic Province up to Japan, and is generally distributed in the British Isles. It is contained in the lists for all the coast counties of England from Northumberland round to Glo'ster inclusive, and is recorded from Cumberland, Westmorland, Lancs, Cheshire, Notts, Leicester, Cambs, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, Wilts, Berks, and Surrey ; from Glamorgan, Brecknock, and Carnarvon in Wales, and from both Scotland and Ireland.

27. **Eurydema dominulus** Scop.

Scop. Ent. Carn., 124, 362 (1766) ; D. & S., B.H. 85 (1865) (Strachia ornata) ; Saund., H.H.B.I. 30 (1892) (Strachia festiva).

Ova. I know of no description of these, but Dufour and Fabre describe those of a closely allied species, *E. ornatum* L. as follows : The eggs have a quite elegant shape and structure. Arranged in series which are in close contact, they look like short, truncated cylinders, and bear no slight resemblance to little barrels set upright. They vary in colour ; sometimes they are leaden black, but more frequently they look like little drums, with a broad black band round the circumference above and below, the space between being white. In this white area are four large round black spots, distributed at equal intervals round the circumference. The lid is flat and black, with a ring round it and a point in the centre, white. The outline of the shell where the lid is set is edged with short hairs, set at regular distances just as in the peristome of the capsule of certain mosses. The batch consists of about a dozen, and they are arranged in two rows.

Larvae. I have taken the nymph by sweeping *Mentha hirsuta*. The following is a description of it : Shape similar to that of imago ; ground colour orange ; head black ; pronotum with two large black patches, confluent behind ; scutellum black with central orange spot ; wing-pads black internally, orange outwardly ; abdomen with four dorsal black fasciae in the area of the scent-glands ; outer margins of segments with black spots ; underside, centre of thorax black, margins orange ; abdomen with black fasciae on the last four segments, and the junctions of the first three lined with black in the centre ; legs and antennae black. The whole appearance will be seen to be extremely handsome.

Life-cycle. The above nymph was found in August and became an imago four days after capture. August is in fact the usual month for the appearance of the imago, and it lasts into September. There are continental records for both June and July. But outside of these four months there are no records.

Habitat, etc. This very handsome species occurs chiefly on Umbelliferous flowers, of which it forms a striking and effective adornment. It is taken, therefore, chiefly by sweeping. I once found a specimen at Alton, Hants, on a gooseberry bush in an old garden. I have also taken it by sweeping such plants as *Mentha hirsuta* in damp places. On the Continent it occurs also on *Cruciferae*, and it has been recorded from *Sisymbrium sophiae*. Chitty describes it as falling to the ground when any attempt is made to capture it as it rests on the flowers of *Umbelliferae*.

E. dominulus is one of a series of upwards of a dozen species which are, similarly coloured and are both very closely allied and at the same time subject to an immense deal of variation in the distribution of the red and black colours within the limits of a single species. They are almost entirely Palaearctic, but some species extend into China and India. Only *E. dominulus* has thus far been found in Britain. Of the allied species, *E. ornatum*, Dufour says that it gives forth no disagreeable odour, however much it is maltreated, and he adds that he has sometimes thought he has detected a faint trace of even a pleasant odour, but whether these remarks apply equally to *E. dominulus* I cannot say.

Distribution. *E. dominulus* is distributed throughout Europe and in Siberia, and is common in many places, extending into both India and Algeria. But in Britain it is both local and rare. It is recorded from seven counties only, viz. Norfolk, Kent, Surrey, Sussex, Hants, Devon, and Glamorgan ; the greatest number of specimens have, I believe, been taken in Sussex, in the Hastings district, but even there it is very local. This, it will be seen, is another species that is almost confined to the counties south of the Thames.

28. **Eurydema oleraceum** L.

Lin., F.S. 550, 934 (1761) ; D. & S., B.H. 86 (1865) ; Saund., H.H.B.I. 30 (1892).

Ova. Undescribed.

Larvae. Last instar, 4½ mm. Head narrowed in front, anterior angles rounded, sides reflexed, eyes prominent, touching pronotum ; pronotum trapezoidal, disc with a deep furrow in front and a shallow one behind; outline of body oval; head with side lobes yellow, margins black, central lobe and vertex black, the latter with a central yellow spot; pronotum strongly punctured behind, black with side margins broadly, a broad elongate central spot, two small spots on anterior margin and four on disc, yellow; scutellum and wing-pads black, strongly punctured, the former with three, the latter with one yellow spot; abdomen pale ochreous, with four central black bars separated by red lines; outside these a broad vinous red band running all round the abdomen; connexivum with black spots, separated by vinous red; legs ochreous, tibiae with black lines, femora with black rings; antennae four-jointed, black; no ocelli.

Life-cycle. Chitty swept one specimen near Faversham on June 29th, 1902, in the afternoon just after a shower. Douglas and Scott (1) record it in July from Cambridge, and there are other records for the months from April to September inclusive; I have a nymph taken at the end of November. Copulation lasts for a considerable time (Amyot), and the paired insects crawl about over the plants tail-to-tail.

Habitat, etc. It is found upon low plants, especially *Cruciferae.* Chitty's specimen was swept from a bed of mixed nettles and thistles, which were growing in what had been the garden of a disused cottage. Douglas and Scott record it as taken by sweeping *Pimpinella saxifraga* on the sandhills at Deal, and it has been found on the Continent on *Brassica oleracea*, cereals, potato, asparagus, *Apium graveolens*, *Cheiranthus cheiri*, *Lactuca*, *Urtica*, and *Lapsana communis.* When these bugs are sufficiently numerous they will seriously damage the potato crops. De Geer speaks of them as doing great damage in his time to kitchen-garden produce and to garden pinks. In the year 1760 the cabbages and turnips were a failure because of the attacks of this insect. Boisduval also speaks of their doing much damage in France to cabbages, turnips, and pinks from May to August. They pierce the leaves in many places, plunging the rostrum into the parenchyma of the leaves, and riddling them like a sieve, so that they become wrinkled and shrivel up; hence the damage done is far more than can be measured by the amount of sap abstracted. Mulsant and Rey speak of this insect as common in France on cruciferous plants, and J. Sahlberg gives *Cruciferae* in June and July for Finland.

There is, however, a check to these ravages in the form of a small hymenopterous parasite, the Chalcid *Pteromalus oöphagus*, and according to Ashmead, the imago falls a prey to the Fossor *Astata boops.*

In Britain it is not nearly common enough to do any damage to either crops or gardens.

Distribution. *E. oleraceum* has a very similar general distribution to the preceding, but in Britain it is more widely spread; it is, however, very scarce, and not often taken in any numbers. It has been found in twelve counties, viz. Cambs, Essex, Kent, Surrey, Sussex, Berks, Hants, Oxon, Glo'ster, Somerset, Devon, and Cornwall. Its habitat, therefore, is chiefly south of the Thames, and there are no records for the North of England, for Wales, or for Scotland or Ireland.

Sub-family V. **Asopidina.**

In this group the rostrum is stout and free from its base, the basal joint not being enclosed between the bucculae, which are small and united posteriorly. This freedom from constraint gives the rostrum a wider range of movement than usual, and, together with its stoutness of build, no doubt finds explanation in the nature of the food ; for the members of this group are found, so far as they have been observed, to be carnivorous, while the generality of the *Pentatomidae* are probably mainly vegetarian in diet. The plants mentioned in connexion with the different species of this sub-family must therefore be regarded as "host-plants" rather than as "food-plants." The group finds its greatest development in the New World, from which as many species have been described as from all the rest of the world put together. Upwards of three hundred species are known, many of them very brilliant in coloration ; in Britain we have only five, belonging to as many genera, and one of these has scarcely any claim to a place on our list. Their smell is very offensive.

All orders of insects are laid under contribution to furnish their bill of fare, but especially Lepidoptera and Coleoptera, and these chiefly when in their larval condition, though ova, pupae, and imagines are also occasionally attacked. The soft integument and the juiciness of the larvae make them, of course, the most desirable prey. Schumacher considers that in case of need they can fall back on a vegetable diet, and describes them as polyphagous, but with a strong preference for an animal diet.

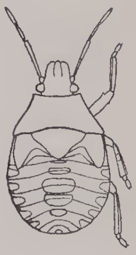
So far as observation at present goes, they seem to be extraordinarily prolific, one ♀ of *Picromerus bidens*, e.g. having laid nearly five hundred eggs, and this is rather strange, as carnivorous animals are usually less prolific than phytophagous ones. An excellent account of most of the European species is given by Herr F. Schumacher (1) of Berlin, and I am indebted to his paper for a large proportion of the details recorded in the following pages about our five British species.

29. **Picromerus bidens** L.

Lin., S.N. i. 718, 23 (1767) ; D. & S., B.H. 96 (1865) ; Saund., H.H.B.I. 33 (1892).

Ova. Egg basin-shaped, with convex lid ; just below the margin of the lid there arise from twenty-six to twenty-nine white, hair-like, hollow processes for the admission of air, with clavate tips, which do not quite rise to the level of the lid ; the greater part of the lid except its margin, as also the rest of the surface, is covered with numerous minute protuberances; colour at first yellowish-rose, later blackish; egg-opener present. Length 1 mm. The eggs are laid at intervals from June to September, and an average of about thirty constitutes each batch. They are deposited irregularly on the leaves of trees on either the upper or the under side, and those of the same batch do not, as those of the *Pentatomina* do, adhere to one another (Schumacher, 1).

Larvae. Last instar, 9–11 mm.; head parallel-sided, anterior angles rounded, side margins raised; eyes touching pronotum; pronotum trapezoidal, much broader posteriorly than anteriorly, lateral margins finely denticulated, strongly punctured and transversely wrinkled; fore parts reddish-brown, with bronze reflections, lateral margin of pronotum yellow; abdomen ochreous brown or deep red (when ochreous with red punctures), area of scent-glands always deep red; connexivum with aeneous bar, in outer centre of which in each segment is an ochreous point, bars separated by a red line; underside red; legs black, with ochreous ring in middle of tibiae, anterior femora toothed; antennae black. The preceding instar, 6 mm., has all the fore parts, the abdominal bars, the square spots on the connexivum, and the antennae and legs entirely brassy bronze; the rest of the abdomen is very dull purplish-red, but paler beneath; there is no trace of the pale rings on the tibiae; the bronze parts are strongly and rugosely punctured, and the red parts have scattered punctures; only a slight trace of a tooth on the anterior femora.



Nymph of *Picromerus bidens* L.

The presence of the bronze lustre in the larva is noteworthy, as no trace of it occurs in the imago; it is even more brilliant in the younger instar. It will be observed, also, that the prominent spines at the hinder angles of the pronotum, which have given the insect the name "bidens," do not appear in the larval stages, but are produced during the last moult. The whole of the coloration except the reddish or brownish parts appears quite plainly in the cast skin, and the white ring on the tibiae is very distinct. These rings disappear as a rule in the adult. But I find that there is a tendency on the part of specimens from the North of England to retain these pale rings on the intermediate and posterior tibiae and to have the apices of the fourth and fifth antennal joints infuscated. I have seen one specimen bred by Mr. H. R. P. Collett which exhibits these features very markedly; this, however, is from Hampshire.

Life-cycle. The insects of the year attain maturity during the later summer months, and may be found in the open till October, when they retire for the winter, finding shelter under low bushes or amongst grass or dead leaves. They appear in the open again in March or April, and from then on to October the imago may be found. Copulation takes place twice in the year, on the part of the insects of the year in late summer and autumn and in May and June amongst the over-wintered specimens. The duration of copulation is from three to twenty-two hours (Schumacher, 1).

Habitat, etc. *P. bidens* is found chiefly in damp places, and a long list of host-plants has been recorded. Schumacher (1) gives the following trees and shrubs: *Alnus*, *Salix*, *Betula*, *Corylus*, *Quercus*, *Rhamnus*, *Prunus*, *Rubus*, *Pyrus malus*, *Ribes nigrum*, *Pinus sylvestris*, *Juniperus*, *Sarothamnus*. J. Sahlberg adds *Epilobium angustifolium*. I have taken it amongst *Calluna*, and Whittaker records it from Hatchmere, Cheshire, on *Myrica gale*; Morley has it from the same plant in the New Forest. It has also been recorded from nettles, *Salvia glutinosa*, *Genista*, and *Polygonum*.

But, as already stated, *Picromerus* is a carnivorous insect and visits the above plants for what prey it can find on them. The earliest record is that of De Geer, who says it feeds upon the larvae of *Hemerobiidae* (lace-wing insects) and of *Chrysomelidae* (Coleoptera). Kühn describes it as an excellent remedy against the bed-bug, *Cimex lectularius*, saying that six or eight specimens of *Picromerus bidens*, when shut up for several weeks in a room swarming with the bed-bug, completely extirpated them. In the New Forest Lucas found a ♀ on, and apparently eating, the dead larva of the fox-moth, *Bombyx rubi* L., and Giard found it sucking the larva of the moth *Acronycta rumicis* on *Polygonum*. Poulton gives the larvae of *Nematus viminalis*, whose ravages on *Salix cinerea* it thus checks. Schumacher also gives examples of the following: amongst Lepidoptera, larvae of *Pieris brassicae*, *Orgyia antiqua*, *Spilosoma lubricipeda*, *Sphinx tiliae*, *Phalera bucephala*, *Acronycta psi*, *Polia chi*, *Dianthaecia capsincola*, and imagines of *Melitaea* and *Lymantria monacha*; amongst Coleoptera, *Galeruca viburni*, and *Phyllobrotica quadrimaculata*; and also larvae of saw-flies and aphides. To these I can add both the larvae and pupae of *Pieris rapae*, and the white larva of the saw-fly, *Phymatocera aterrima* Klug, that lives on Solomon's Seal. But perhaps most remarkable of all, I have found the nymph ready to attack the larvae of *Euchelia jacobeae* when other supplies failed. As long as other species were available, it avoided these, but when it could get nothing else it boldly attacked these caterpillars, notwithstanding their warning coloration. From these various facts it will be seen that *Picromerus bidens* may rank amongst insects useful to agriculturists, though it is probably not common enough in the British Isles to make much difference to British farmers.

Picromerus itself, also, according to Ashmead, falls a prey to the fossorial hymenopteron *Astata boops*.

The abstraction of the juices of the prey is evidently a slow business, and we find that the bug remains sucking the captured larva sometimes for hours at a stretch; thus there are records for 5, 7, 8 hours, while, in one instance, that of a larva of *Pieris brassicae*, the common cabbage butterfly, the bug, which killed its prey in 4 minutes, remained sucking it for nearly 19 hours. After such a prolonged meal the insect is gorged, and the abdomen is enormously distended, so that it seems as if a little pressure would burst it. The prey does not always succumb so readily. Schumacher gives an instance in which a larva of *Sphinx tiliae*, 5 cm. long, on being pierced by a *Picromerus* near its horn, began to crawl away, carrying the bug with it; twisting itself and striking violently round, the caterpillar released itself after a few minutes. But the bug attacked it again in another place, and again the larva freed itself. The bug was not disheartened, but made a third attempt, and soon the caterpillar was able to crawl no farther, and after 20 minutes it became motionless, though it did not die till the following day. Sometimes the bug carries the larva about dangling from the end of its rostrum. The rostrum is capable of great freedom of motion, and when in use is carried in a porrected position, and the setae do not appear to leave the protection of the rostral trough throughout their entire length. This is quite different from what obtains in the *Capsidae.*

In voiding the excrement, the larva elevates the abdomen considerably, by drawing the two hind pairs of legs nearer together and stretching them into a more upright position; the excrement, which is a pinkish or ochreous liquid, is ejected with considerable force. Two larvae which I kept for some time were fond of resting facing one another and with their heads in contact. They also communicated with one another by rubbing their antennae together, as ants do.

Distribution. *P. bidens* inhabits the greater part of the Palaearctic Region and is widely distributed in Britain. It is recorded from all the coast counties extending from Norfolk southward and westward to Cornwall, and also from Northumberland, Cumberland, Yorks, Cheshire, Notts, Warwick, Oxon, Cambs, Surrey, and Berks; the Welsh records are from Carnarvon and Glamorgan, and it is found in both Scotland and Ireland. According to Frey Gessner, it occurs in Switzerland up to a height of 2500 feet, and I have found it on Mt. Pilatus, though at a somewhat less height than that.

30. **Rhacognathus punctatus** L.

Lin., S.N. i. 720, 34 (1767); D. & S., B.H. 92 (1865); Saund., H.H.B.I. 35 (1892).

Ova and **Larvae.** There are no records of the early stages of this insect, and both eggs and larvae are apparently undescribed. From a note I have received from Mr. F. H. Day, the larva would appear to resemble that of *Zicrona caerulea.*

Life-cycle. The imago of the year probably appears in August or September. But it evidently hibernates, since it is found all through the year. There are, in fact, records for every month.

Habitat, etc. It is sometimes found in moss, and I have taken it amongst heather. J. E. Mason found it in Cornwall in a tuft of furze and heather;

Marshall records it from sallow at Rannoch. Reuter (5) also gives *Salices* in June. Other plants on which it has been found are Blaeberry (McGregor), *Epilobium angustifolium*, *Betula alba*, *Alnus glutinosa* (Parfitt). Mulsant and Rey give also oak and *Sorbus*. Continental records include, besides the above, aspen, *Pinus domestica*, *Clinopodium vulgare*, *Betonica officinalis*, *Origanum vulgare*, *Cirsium oleraceum* (Schumacher, 1). D'Antessanty found it in November and December amongst fallen oak branches. It appears, in fact, to belong more to the ground and low plants than to trees. Flor gives "bushes." Bedwell found a number of specimens in *Sphagnum* in September. F. H. Day reports rearing it by feeding it on Halticid beetles, and Schumacher fed it in captivity on dead flies.

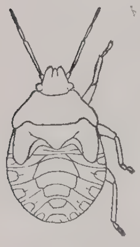
Distribution. It is spread over Europe, reaching as far as 67°, and occurs in Northern Asia as far as China and Japan. In Britain it is widely distributed, though never common. It is recorded from fifteen counties in England, viz. the nine coast counties from Norfolk to Cornwall, together with Surrey, Berks, Bucks, Staffs, Cheshire, and Cumberland. It was found by Marshall at Loch Rannoch in Scotland, but there are no records for either Wales or Ireland.

31. **Troilus luridus** Fabr. (=Podisus id. Osh. Cat.).

Fab., S.E. 701, 25 (1775) ; D. & S., B.H. 94 (1865) ; Saund., H.H.B.I. 34 (1892).

Ova. I have received from Mr. H. Main a small cluster of eggs attached to a furze spine, which I feel sure belong to this species. Another cluster is in the University Museum of Zoology, Cambridge. They are very much like the eggs of *Picromerus*, but with longer and less numerous spines. They are barrel-shaped, shining, and of a dark brown colour ; just below the cap there are twelve white hair-like processes, at first upright, and then curving outwards, and rising above the level of the cap. The surface of the chorion is delicately reticulated.

Larvae. The larvae of this species are more frequently seen than those of any other of our Asopidina, and are certainly the most handsome we possess.


Nymph of *Troilus luridus* F.

Last instar, 8½ mm. Head somewhat rectangular in outline, with anterior angles rounded and with central lobe not reaching so far as side lobes ; pronotum trapezoidal, finely denticulated at sides, hinder angles rounded, slightly projecting and slightly raised, but not with the prominence they possess in the adult ; abdomen rather short and rounded at the sides ; antennae four-jointed and tarsi two-jointed ; head, pronotum (except lateral margins in front), scutellum and wing-pads brilliant coppery-green, often with a golden lustre, the whole of the fore parts rugosely punctured except on two small discal areas on the pronotum ; abdomen and lateral margins of pronotum in front cream-white or ochreous, sometimes orange or reddish; each abdominal segment after the first with a central transverse dorsal fascia in the area of the scent-glands, and a trapezoidal spot on each side also coppery-green; legs pale testaceous, spotted with black, apex of last tarsal joint black; underside white with a faint greenish tinge; antennae with first three joints reddish, each paler at apex, apical joint fuscous. The brilliant metallic green of the nymph remains without diminution on its cast skin, although so much of the skin as covers the non-metallic parts comes off quite colourless. It will be seen that the coloration of the larva is much more brilliant than that of the imago, the metallic green being but very feebly represented in the adult.

3rd instar, 4–5 mm. Fore parts metallic green with slight coppery reflections; abdomen cream-coloured, passing into red outwardly; central metallic bars as before; connexivum red with large metallic green spots of the shape of a half ellipse, set with its major axis horizontal; legs and antennae black; margins of pronotum scarcely dentate; surface of thorax with large, scattered punctures and some irregular striations; head irregularly transversely striate.

2nd instar, 3 mm. All the parts that were metallic in the above instars are in this shining black with a slight greenish lustre; the pronotum has a broad band on each lateral margin bright ochreous yellow, and two similar but fainter spots on hind margin; the cream-coloured parts of the abdomen are in this instar orange, passing into red.

1st instar, 1½–2 mm. Similar to the 2nd, but with pronotum wholly black except a faint indication of an ochreous spot at anterior angles; the black parts have scarcely any metallic lustre.

I do not possess the 4th instar.

Life-cycle. The nymphs mature in the latter part of July and the beginning of August. But there are definite records of the occurrence of the imago in all the months from March to October. Evidently, therefore, the insect hibernates as imago. Schumacher says it may be met with all the year round. Larvae of various stages occur at the same time, so that probably oviposition takes place at various intervals. The earliest time for freshly disclosed imagines is July (Schumacher, 1).

Habitat, etc. It has been found on a great variety of host-plants, such as oak, beech, birch, alder, mountain ash, white poplar, apple, larch, fir, whitethorn, hazel, sallow, aspen, hornbeam, *Cakile maritima*, *Clematis*, *Rubus idaeus*, *Rhamnus cathartica*, *Acer dasycarpum*, *Mentha*. The insects are found not only on the leaves of the trees in the above list but also in some cases running about on their trunks. In winter they are to be found under moss, dry dead leaves, and the remains of dead plants, though in some cases they seem to winter on fir trees. It is generally obtained by beating, and feigns death in the net.

On one occasion a larva of *Troilus* was seen sucking one of *Piezodorus lituratus* with great avidity, and by taking this hint and supplying some other examples with similar sustenance, several were brought to maturity. They can, however, endure abstinence for a considerable time; one which remained without food for nearly a fortnight performed its final change satisfactorily, and seemed as lively as ever. It has also been known to feed on the beetle *Galerucella viburni* (Esam). A larva, probably of this species, was found at Battle, Sussex, sucking the beetle *Phyllodecta vitellinae* (Donisthorpe). Another larva was found in the New Forest feeding upon the mature or nearly mature larva of the Vapourer Moth (*Orgyia antiqua*) (Lyle). It was apparently undeterred by the exceedingly hairy character of the caterpillar, although *Picromerus bidens* found a difficulty in a similar case. Both these observations were made in August. The latter insect was beaten from oak, but, undisturbed by the shock, the bug was still sucking at the caterpillar when it fell into the beating tray, and continued to do so for an hour, by which time its victim appeared to be quite flaccid. Mr. Lyle states that he has commonly observed such Hemipterous larvae devouring caterpillars in the New Forest, but that he has never seen one before with prey of so large a size (Poulton, " Trans. Ent. Soc.," 1906). Other examples of the diet of this insect are larvae of *Pyralidae* (Gorski) and *Lymantria monacha* (Schumacher, 1).

Distribution. *T. luridus* is very widely distributed, being found throughout Europe and Siberia, and also in N. India and Burma. In Britain the imago is much less often seen than the larva, but it is recorded from the coast counties from Norfolk round to Glo'ster, and also from Notts, Cambs, Warwick, Oxon, Wilts, Berks, and Surrey, from Merioneth and Pembroke in Wales, and from Ireland, though not from Scotland. Thus in Great Britain its range is bounded in a northerly direction by Lat. 55° N., while in Ireland it extends two degrees farther north, having been found in Galway (Halbert).

32. **Jalla dumosa** L.

Lin., F.S. 249, 929 (1761); D. & S., B.H. 90 (1865); Saund., H.H.B.I. 35 (1892).

Ova and **Larvae.** The early stages of this insect are at present undescribed. Larvae were, it is true, taken at Deal, but unfortunately no description of them was preserved, and as the insect is so rare in this country, English entomologists can only hope that a description may be forthcoming from some one of their continental colleagues, who have more frequent opportunities of meeting with the insect.

Life-cycle. E. Saunders found the larva in July, and as there are continental records for the imago for all the months from March to October inclusive, its life-cycle is probably similar to that of *Troilus* and *Picromerus*. Its hibernating is done in moss and under stones.

Habitat, etc. It frequents dry, sandy places and stony, sunny hillsides, and is most frequently found either running on the ground, clinging to low plants, or under leaves. Thus, under dry grass, *Erodium*, *Calluna*, and *Sarothamnus* are some of the habitats, and it has also been found *on* bushes and low plants, such as *Betula*, *Corylus*, *Vaccinium*, *Hippophaë rhamnoides*, *Centaurea scabiosa*, and *Pteris aquilina*. There are not many records as to its diet, but what there are all point in the direction of carnivorous tastes. The most remarkable is an observation of Brischke. Speaking of the enormous numbers in which the caterpillars of *Dasychira selenitica* appeared in the autumn of 1877 in the neighbourhood of Dantzig, he continues, " On a sunny day in March, 1878, I betook myself again to the same spot in order to collect the caterpillars, but to my astonishment I found only skins, which were blown about by the wind. Being surprised at this, I searched about carefully under the dry grass, heather, and broom, and then I found the explanation of the mysterious phenomenon. There were many bugs engaged in sucking at caterpillars which were either crawling about or lying still, and several times I found two or three busy with one caterpillar, and I could find only a few uninjured caterpillars. The bug was *Jalla dumosa* L., which I had previously found only quite sporadically, because I had not expected to find them so early in the year." (" Ent. Nachr.," 1881, vii, p. 32.) Populus speaks of finding it in flood refuse in September. Schumacher (1) kept an over-wintering specimen in his insectarium and fed it with caterpillars of *Bombyx castrensis* L. Its greatest meal was on the 1st of June, when it drained dry five caterpillars, each about 3 cm. long.

Distribution. *J. dumosa* is distributed throughout the greater part of the Palaearctic Province, but its claims to a place on our British list are slender, and rest upon three or four rather ancient captures only. As already mentioned, a larva was taken at Deal, that celebrated resort of rarities ; Douglas and Scott (1) record three specimens without definite locality, and Dr. Power also took it ; there are three specimens in the Power Collection. Except for that remarkable incident in Brischke's experience, the insect does not seem to be anywhere very common, or to occur much more than singly. Frey Gessner found a specimen in the Jura Mountains in Switzerland at a height of 2800 feet.

33. **Zicrona caerulea** L.

Lin., F.S. 250, 933 (1761) ; D. & S., B.H. 88 (1865) ; Saund., H.H.B.I. 36 (1892).

Ova. According to Mayet, the eggs are spherical and at first white, but becoming darker from day to day till at last they are shining black. They are laid in spring on leaves, and about fifty is the average number. Kirkaldy describes them as shining, dark brown, smooth, with a ring of seventeen slender processes round the lid ; processes whitish, each with extreme apex blackish. Within the egg just under the lid there is a separate membranous strip with a shallow, spoon-like head, strengthened by a T-shaped chitinous rib. This apparatus, which is of course the egg-opener, projects slightly from the hatched-out egg. Often the lids slip away entirely after hatching.

Larvae. The larva resembles the imago. On emergence from the egg it is of a reddish colour ; it retains this colour for several days, but afterwards gradually gains a blue reflection ; by the time that the wing-pads appear the whole insect has become metallic blue (Mayet). Of the last instar, Schumacher gives the following description : Head rectangular, clypeus free, side margins flat ; eyes facetted ; antennae four-jointed, 2=4×1, 3=$\frac{2}{3}$×2, 4=3 ; pronotum trapezoidal, lateral margin sharp, not toothed ; tarsi two-jointed ; head, pronotum, wing-pads, area of scent-glands, and spots on the connexivum dark metallic blue, more rarely green ; the rest of the abdomen and the greater part of the underside chiefly bluish-red ; legs, antennae, and rostrum black. Length 5–6 mm.

Life-cycle. The eggs, as already stated, are laid in spring. Larvae may be found from July to September. The earliest date for newly disclosed imagines is the beginning of July. The insects of the year pass the winter in various kinds of places, such as under *Calluna* or juniper, under stones, under dry dead leaves, and in moss at the foot of trees. It is astir early in the year, for Schumacher records finding one quite active amongst dead leaves on the 4th March. Douglas and Scott (1) state that it has been taken flying in spring. There are records of the capture of the imago in every month in the year except November. Thus the life-cycle is evidently similar to what is found in the rest of the Asopidina. Kirkaldy gives the following dates showing the development of one individual. Pair *in cop.* May 4th ; ♀ laid eggs 5th, hatched 11th ; first moult 14th, second 17th, third 20th, fourth 23rd, fifth to adult 28th. This was in India, and was no doubt quicker than would have been the case in Britain.

Habitat, etc. This brilliant little creature is one of the commonest of our Asopine bugs, and is generally taken by sweeping or by searching amongst the herbage and vegetable débris under such shrubs as juniper, etc., as well as in moss. It is found in dry heathy places, but also in damp spots amongst *Mentha hirsuta* and other tall plants ; I have found it even in a boggy place, while on the other hand it has been seen by two observers sunning itself on the top of a stone (Morley and Kidson Taylor). Reuter says it lives generally on *Salix*, but it is found on many other plants as well, viz. *Quercus*, *Rubus*, *Betula alba* and *nana*, *Alnus glutinosa*, *Juniperus communis*, *Rosa canina*, *Euphorbia*, *Fragaria*, *Glycyrrhiza*, *Thesium* (several species), *Daucus carota*, *Mentha hirsuta*, *Calluna vulgaris*, *Artemisia*, grasses and ferns. It is found also under as well as on most of the above plants, and at the roots of grass, as well as under dead and dry leaves and under stones. Flor gives " in damp meadows." It has also been found on a pine tree and commonly occurs on vines.

Like the other species of this section, it is carnivorous in its tastes, and the above plants must be regarded as "host-" rather than as "food"-plants. It seems specially inclined to select its prey from the order Coleoptera. Thus it was once seen sucking the beetle *Lochmaea capreae;* Puton says that it destroys *Graptodera ampelophaga*, and this is why it is found on vines, seeing that this beetle is a parasite of the vine; *Zicrona* therefore renders good service in the vine-growing districts of the Continent. Day also reports it as feeding on Halticid beetles. Kirkaldy says that it destroys *Haltica caerulea*, the very young larvae feeding on the eggs of the beetle and the other instars on its larvae, while the adult bugs feed on the adult beetles. Various writers on the Continent have called attention to its usefulness in this way, and notably Mayet, in "Les insectes de la vigne" (1870), gives much information about the services rendered by *Zicrona* in the vineyards in all the ways described above. Full-grown bugs will destroy the beetles at the rate of a dozen a day.

On November 17th, 1915, were exhibited at a meeting of the Entomological Society of London two specimens of *Zicrona caerulea* and a freshly emerged ♂ blue butterfly (*Agriades coridon*), which were taken at Royston, Herts, on July 25th; the bugs were found sucking the butterfly, one attacking the thorax, the other the abdomen.

In his insectarium, Schumacher found that *Zicrona* preferred to attack the smaller insects, such as house-flies and the larvae of beetles. Living caterpillars usually proved to be too powerful for it, though it quite readily sucked the juices of dead ones, such as *Sphinx tiliae* and *Phalera bucephala.* In one instance, however, it attacked and killed an almost fully grown, though feeble, caterpillar of *Pieris brassicae.* It then remained sucking the corpse for seven hours. But such instances are exceptional, and it usually attacks much smaller insects. In China it feeds on the beetle *Haltica caerulea*, and in India probably upon *H. cyanea* (Lefroy).

I have often found dead specimens of this insect lying about under herbage, far more frequently in fact than of any other Pentatomid. Of course its bright colour makes it conspicuous, and therefore more easily noticed than an ordinary brown bug would be, but I do not think this is the only reason for its being seen more frequently. Possibly there may be something in the metallic coloration which renders it tougher and less subject to disintegration or decay than species not so adorned.

Jennings instances a specimen which had the left posterior leg much shortened, though each part preserved its proper proportionate length relatively to the others.

At an exhibition held by the South London Entomological Society a specimen of this bug was captured on the table which held the fungus exhibits, having apparently been introduced with the fungi.

Curtis says it flies well in sunshine.

Distribution. *Zicrona* is a very widely distributed insect, occurring throughout both the Palaearctic and Nearctic Regions, except in the highest latitudes (reaching, however, 68° 20′ in Finland), and descending into the Oriental as well. In the British Isles it exists also over a wide area. It is recorded from all the counties on the east and south coasts of England except Suffolk, from all on the west coast of England except Monmouth, from the inland counties of Warwick, Oxon, Bucks, Herts, Wilts, Berks, and Surrey, from Glamorgan and Carmarthen in Wales, and from Scotland. Dr. G. Johnson notes it as occurring on Cheviot Moors near Dunsdale. It has not yet been recorded from Ireland.

Sub-family VI. **Acanthosomina.**

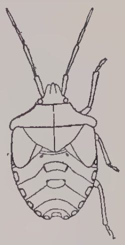
The Acanthosomina are a comparatively small sub-family, containing about a hundred described species, of which nearly three-quarters belong to the three genera *Acanthosoma*, *Sastragala*, and *Elasmostethus*. They occur in all parts of the world, though unequally, the Oriental Region being the richest and the Ethiopian the poorest in species. Of the thirty-four Palaearctic species we possess five, which are easily distinguished from the rest of our *Pentatomidae* by their angular shape and their two-jointed tarsi. It is an interesting question why this particular sub-family should fail to follow the example of all the rest of our *Pentatomidae* and to increase the number of tarsal joints at the last moult, and what bearing this has upon their habits and well-being. The tarsi themselves are not noticeably shorter than in most of the other species, and it is difficult to see how this reduction can affect their general economy. They are, as a rule, vegetarian in diet, and are easily reared in their later larval life. Curtis considered them to be carnivorous in all their stages, living upon the juices obtained from small insects, especially caterpillars. But modern experience tends to show that they are far more generally vegetarian. This sub-family is noteworthy as having yielded the classic instance of maternal solicitude amongst the Hemiptera.

34. **Acanthosoma haemorrhoidale** L.

Lin., F.S. 248, 925 (1761); D. & S., B.H. 107 (1865); Saund., H.H.B.I. 39 (1892).

Ova. The ova of this species are hitherto undescribed.

Larvae. The nymph differs very considerably from those of *Elasmostethus* and *Cyphostethus*, and is shaped something like that of *Pentatoma rufipes*, from which, however, it can easily be distinguished by its longer antennae and by the absence of any metallic coloration. The following description is taken from nymphs captured in Windsor Forest on hawthorn: Length 7–8½ mm. Head rather narrowed anteriorly, central lobe slightly projecting; pronotum trapezoidal, with lateral margins slightly concave, and posterior angles rounded and slightly projecting, but not sharply produced as in imago; abdomen, as usual, broader in proportion than in imago and widest before the middle, margin strongly curved; antennae long, four-jointed; tarsi as with other *Pentatomidae*, two-jointed, notwithstanding that they are only two-jointed in the adult; colour green, with side margins of head and pronotum rosy, passing inwardly into yellow; a rosy band appears across the hinder half of the pronotum just before the final moult; head, pronotum, and wing-pads with strong black punctures, remotely placed; fasciae on the dorsal segments of the abdomen in the position of the scent-glands with a black spot at each end, the space between them more or less rosy, passing into yellowish next the black spots, the whole fascia black punctured; rest of abdomen smooth and impunctate; connexivum yellow with a rosy streak at the anterior and posterior edges of each segment, followed by distinct black streaks united to the black margin; sometimes these black streaks unite to form a semi-circle, enclosing an area similar to what is seen in *Pentatoma rufipes*, but on a smaller scale, and then the whole body is tinged with red; underside whitish-green; legs yellowish-green, last joint of tarsi rosy; antennae with first joint red, second yellow at base, rosy at apex, third rosy except at extreme base and apex, fourth yellow, more or less infuscated at apex; the exuviae derived from the last moult are colourless except for the black punctures, the black streaks or semi-circles, and a black marginal line to the abdomen.

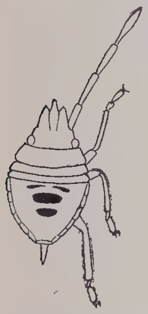


Nymph of *Acanthosoma haemorrhoidale* L.

4th instar, 6 mm. In this instar the coloration is similar, but the pronotum is differently shaped; the side margins are reflexed, but it is not so much raised and extended behind; the wing-pads are very short, and there are no semi-circles in the connexivum, but only black streaks.

3rd instar, 4½ mm. Coloration similar; puncturation more diffuse; thoracic segments shorter; no wing-pads; no marks in connexivum; central lobe of face more prominent.

2nd instar, 3¼ mm. Very little green is present; abdomen chiefly red, with black dorsal bands at the scent-glands; connexivum with an oval black mark in the centre of the margin of each segment; head very large; legs and first two joints of antennae reddish, third joint reddish, becoming black at apex, fourth joint black.



Larva of *Acanthosoma haemorrhoidale* L. 1st instar.

1st instar, 2½ mm. Head very large, rostrum very long, longer than body, appearing both in front of head and beyond end of abdomen; antennae also longer than body; head reddish-green, becoming blackish on vertex; thorax reddish or black; abdomen red, with two black bars in the region of the scent-glands, preceded by a pair of shorter ones, one on each side; connexivum with oval black line on each segment; antennae and legs orange, last antennal joint black; body nearly circular. The exact coloration depends upon the age of the instar; when freshly disclosed it is almost entirely red.

Unfortunately the colours, in almost all the instars, disappear to a large extent on drying, and the whole insect becomes of a more or less dirty blackish brown; but it can generally be recognised by the length of antennae and legs.

Life-cycle. The nymphs described above I found on August 2nd, and two became imagines on August 8th, and others within the next few days. As with most of the *Pentatomidae*, July and August are the months in which larvae are found, while the imagines may be obtained in August, September, and October. There are, however, records for all the months of the year except January. The insect, therefore, passes the winter in retirement in the imaginal form, reappearing in the open in spring. They are rare in July, for no doubt by that time the over-wintered specimens are dead, while the insects of the year very seldom mature before the middle of August. Sauzé reports a specimen at Brixton on February 23rd; Hallett found one under loose bark of larch March, 1916 (this was a very dark specimen); Morley (4) records one in April on a dead crow, and Johnson reports one from Ireland in May; Dale also describes it as taken from August to the following May. The eggs would probably be laid in June.

Habitat, etc. *A. haemorrhoidale* usually inhabits hawthorns, especially when the bushes are well furnished with berries, but it has also been found on beech, sallow, maple, birch, oak, lime, hazel, aspen, *Prunus padus*, and *Lilium martagon*. Flor adds *Sorbus aucuparia*, and H. R. P. Collett has found it on willow. It is occasionally found in towns, and this no doubt implies considerable powers of flight. When resting, the bugs lie flat on a leaf, with the antennae bent back at the sides, and the larvae assume the same position. Of course it is usually obtained by beating.

Mr. T. Edmonds took a ♂ at Totnes, entirely reddish ochreous, and with broad, dark borders to the wings; the membrane also darker than usual; dorsum of abdomen red with black markings.

Distribution. It is distributed throughout most of the northern parts of the Palaearctic Region, and is widely spread in Britain. It is recorded from all the coast counties from Yorks to Glo'ster inclusive, and also from Lancs, Cheshire, Staffs, Notts, Warwick, Hereford, Oxon, Bucks, Herts, Wilts, Berks, and Surrey, from Glamorgan and Pembroke in Wales, and also from the North of Ireland, but there is no record from Scotland.

35. **Acanthosoma interstinctum** L. (=Elasmostethus interstinctus, Osh. Cat.)

Lin., F.S. 927 (1761); D. & S., B.H. 104 (1865) (dentatum); Saund., H.H.B.I. 39 (1892) (dentatum).

There has been much confusion as to both the generic and specific names of this insect. It is the *Acanthosoma dentatum* of Saunders' "Hemiptera-

Heteroptera of the British Islands," but not the *A. interstinctum* of that work ; in the recent general Catalogue (Kirkaldy's) it is referred to the genus *Elasmostethus*, of which, indeed, it is taken as the type. The name *Elasmostethus* refers to the vertical plate projecting from the middle line of the sternum.

Ova. The egg is undescribed.

Larvae. The nymph (7 mm.) is coloured as follows : Ground colour green ; head, thorax, and wing-pads tinged with fuscous ; hind margin of thorax and a spot at humeral angles of wing-pads black ; inner segments of wing-pads outlined with black ; two transverse bars in area of scent-glands blackish with two pale shades ; hind margin black ; they are set in a patch of pale pinkish and yellowish-white ; in front of first bar are two shorter black bars ; margin of connexivum with longitudinal black streaks ; antennae red, darker towards apex ; central lobe of face outlined with red ; legs greenish, tarsi reddish, darker towards apex ; pronotum and scutellum remotely punctured and transversely striate ; wing-pads very remotely punctured ; central lobe of face projecting beyond side lobes ; abdomen oval.

Preceding instar (6 mm.). Similarly coloured, but with very short wing-pads. A younger instar, probably the 2nd, which I received from the late Lieut. H. V. Corbett of Doncaster, September 3rd, 1915, measured $1\frac{3}{4}$ mm. Fore parts shining black, with a thin yellowish central line to the thoracic segments ; abdomen pale green, in the centre a pink patch running the whole length, in the form of an inverted triangle ; a yellowish patch at centre of base of this triangle, in continuance of the thoracic line ; in this patch also, in the region of the scent-glands, are two black bars on successive segments, preceded by a pair of shorter ones, one on each side of the yellow patch ; margin of abdomen yellow, and without black streaks ; legs and antennae black ; central lobe of face projecting considerably beyond side lobes ; sides of abdomen rounded, broadest at middle of insect ; abdomen almost circular in outline ; antennae four-jointed, tarsi two-jointed. The colours disappear on drying.

Life-cycle. The imagines of the year appear in August, and may be found till October. The species overwinters as an imago, and specimens have been found in all the months from March to October inclusive. J. E. Mason records a specimen from Scotch fir, April 11th, 1898, evidently an over-wintered example still remaining in its winter retreat.

Habitat, etc. This species usually inhabits birch, but it is recorded also from poplar, beech, alder, aspen, oak, fir, and juniper. It is therefore usually taken by beating.

Distribution. It is distributed throughout the northern part of the Palaearctic Region, including N. China and Japan ; it is recorded also from Hong Kong. In Britain it occurs as widely as the preceding, and extends further northward. It is recorded from all the coast counties from Northumberland to Dorset, except Durham, and also from Cumberland, Lancs, Cheshire, Notts, Leicester, Warwick, Glo'ster, Herts, Wilts, Berks, and Surrey, from Carnarvon and Merioneth in Wales, and from both Scotland and Ireland.

36. **Elasmostethus griseus** L. (=Clinocoris id. Osh. Cat.).

Lin., F.S. 249, 926 (1761); D. & S., B.H. 101 (1865); Saund., H.H.B.I. 40 (1892) (interstinctum).

The synonymy of this species is even more confusing than that of the preceding. It is the *Acanthosoma griseum* of Douglas and Scott's "British Hemiptera," the *Acanthosoma* (*Elasmostethus*) *interstinctum* of Saunders' "Hemiptera-Heteroptera of the British Islands," and in Kirkaldy's Catalogue it stands as *Elasmucha grisea*, and in that of Oshanin as *Clinocoris griseus*.

Ova. This insect affords the classic instance of maternal devotion amongst the Hemiptera, as originally noticed by Modéer in 1764, more fully described in the observations of De Geer and confirmed since by Mr. E. Parfitt and the Rev. J. Hellins of Exeter, and by others. Mr. Hellins (3) writes as follows: "On June 4th, 1871, I noticed an *Acanthosoma griseum* on one of the lower branches of my birch tree, apparently engaged in extracting some nourishment from the catkins; she seemed quiet, and the underside of her abdomen, near the tip, had a greenish tint, suggestive of a batch of eggs soon to be laid; I saw her again on the 5th, a little way off from her previous position, and again I found her on the 6th very near the same spot; at 3 p.m. on that day I looked again, and found her close to where she was on the 4th, and now engaged in laying eggs on the underside of a leaf. I did not see an egg actually extruded, but I saw the whole batch gradually placed in order.

"She began by depositing one egg, then a row of two or three, then about five, till, at the widest row, there must have been seven or eight; then she diminished the rows again till she came to a point, the whole mass, in number between thirty and forty, forming a rough diamond figure just about the size of her own body. The outer eggs were laid on their sides, the inner ones stood up on end. I detached one and examined it with the microscope and found it long in shape, twice as long as wide, plump, a little depressed on the sides, reticulated all over very faintly, somewhat glossy, and in colour pale whitish-green. The mother now took her stand over these eggs, but I do not think her body touched them; towards the end of June I noticed that the side of the eggs nearest the sun had become yellowish, and on the 29th I found the young bugs all hatched and clustered under their mother amongst the empty egg shells."

Larvae. With regard to this little family Mr. Hellins continues: "They were yellowish-green in colour, their thoraces becoming darker than the abdomens, and I saw them moving their antennae. On July 3rd I found them showing a red streak down the middle of the abdomen, and on the 6th they had moved from among the egg shells and were got together by themselves. About this time the wind was occasionally rough, and I think was the cause of some of them disappearing, for I could not find that any moved away of themselves, and so concluded that they had been blown or shaken off their leaf. On the 9th I found them moulting, and saw some of them kicking away their cast skins behind them; their colours were bright at first, yellow with vermilion stripe, and they soon began to move about more freely, and on the 13th migrated—now with sadly diminished numbers—to a neighbouring catkin. I now packed up the mother with eight young ones and despatched them to Mr. Douglas, but, unfortunately, he was from home, and returned only to find their dead and dried bodies."

The following is a description of a larva in its first instar: Length just over 1 mm. Elongate oval, head very large, triangular, with sinuate reflexed lateral margins; central lobe of face very large and projecting far beyond side lobes, reddish-yellow; eyes red, touching pronotum; thoracic segments very transverse, with rounded sides and central furrow, yellowish, mottled with brown; abdomen yellowish with scent-glands brown, a brown line along the lateral margin of each segment; antennae four-jointed, brownish-yellow, last joint stoutest, brown; legs concolorous with antennae; tarsi two-jointed, second joint very large and stout; claws yellow, strongly curved; rostrum longer than body.

Last instar 4½–5½ mm. Central lobe of face projecting beyond side lobes; the latter outwardly sinuate; head more or less reddish ochreous; central lobe outlined with black; two longitudinal red streaks between this and the eyes; pronotum rather short, ochreous with six longitudinal black stripes; scutellum ochreous with central straight black line, and two angulated side lines; wing-pads reddish ochreous, with two black lines, inner segment outlined with black; abdomen green, with two double semi-elliptical black streaks in the area of the scent glands, each with a white centre and on reddish ground; a pale ochreous line passes along middle of abdomen between the above marks, and a transverse black mark lies behind them; connexivum white with black streaks at side margins; legs greenish ochreous; tarsi two-jointed, reddish, darker at apex; on the abdomen just below the scutellum and in front of scent-glands are two sloping curved black marks; two black dots at apex of abdomen; antennae four-jointed, reddish, darker at apex; underside pale greenish. This nymph is easily recognised by the system of longitudinal black lines with which the fore parts are marked. The cast skin shows these and the other black markings very distinctly, and they give it a zebra-like appearance. All other colour disappears in the exuviae except a slight trace of red on the wing-pads. The previous instar is very similar to the above, with the same system of black lines, but with very short wing-pads. Length 3 mm.

Life-cycle. I have found specimens *in cop.* at the beginning of June. This, combined with the above observations of Mr. Hellins, shows that oviposition takes place very soon after copulation, and further that the egg-state lasts about three weeks. The life-history would therefore appear to be as follows : imagines appear chiefly during August, and are to be found on the trees throughout the autumn ; the insects hibernate, appearing in the open again in April or May (J. E. Mason records one example on 22nd May, 1898, in Skellingthorpe Wood, Lincs). Pairing takes place at the beginning of June ; oviposition speedily follows, and the larvae appear towards the end of June and are to be found on the trees in July and August, maturing in the latter month. Prof. Carr, however, reports "nymphs" very common on birch, June 29th, 1899. The above is probably also the course with many other *Pentatomidae.*

Habitat, etc. There is no question that the chief food of this species is birch, but it has also been taken on alder (Parfitt) and aspen. Specimens have been found wintering on Coniferae (Reuter, 19), when of course the birch trees are leafless. Bechstein says that it feeds on the caterpillars of the moth *Diloba caeruleocephala* (Schumacher). Curtis once found it on larch at the end of August, and Morley (4) describes finding one in a dead crow's head.

There are several records of the manifestation of the maternal instinct, and the earliest detailed account is that of De Geer. He several times found a mother at the beginning of July surrounded by her family, some twenty, thirty, or even forty in number. She kept near them continually, generally on a catkin or a leaf. Their movements were much like those of a hen and chickens, for they did not always remain on the same spot, and as the mother moved away the young ones would follow her whithersoever she went, and stop when she stopped. She was always on guard, and seemed to take great care of them. On one occasion the observer cut off a birch twig on which there was such a family, when the mother manifested great anxiety, continually flapping her wings rapidly, but without moving from the spot, as if trying to scare the enemy away, although, of course, if she had not had charge of her young she would have sought her own safety at once by flight.

The next record is by Mr. E. Parfitt of Exeter (Douglas and Scott, 1). He says : "When I first saw the mother sitting in bright sunshine in the midst of her progeny on a birch leaf I was much struck with the happy appearance of the family ; it reminded me at once of the affection I had seen evinced by female *Forficulae* for their young. The mother would occasionally get up and look around her, apparently to see if any enemy were approaching, and if all was quiet she would sit down again. When disturbed by anything, for instance, by a bit of stick with which I touched a young one, the mother directly came to the rescue, putting her antennae down to the little thing and drawing them over it. If that did not do, she would walk round it and endeavour to protect it. I repeated the experiment with some of the other young ones to see if it was really affection I had witnessed, and she repeated very nearly the same conduct, now and then placing a leg over it."

The Rev. J. Hellins (1) witnessed on two occasions similar examples on a birch tree which he had in his garden. Of the first he writes thus : " On the 19th of last month (June, 1870) as I was poring over the outer twigs my eye fell on a reddish-brown bug sitting motionless on the under side of a leaf, just at the level of my head. On looking at it more closely I saw it was covering, as well as it could, a number of young bugs, in their first stage, I suppose, after leaving the egg, for the cluster of egg shells could be seen quite empty and transparent under one side of the mother, while the young ones were mostly congregated under the other side. At this time the brood, numbering less than twenty, were clustered together in two or three rows, some lying over the others and really—but for their being silent and motionless—reminding one of a numerous litter of sucking pigs. The parent bug showed no fear, and barely moved when I touched her, only shifting her legs and sloping her shoulders and back so as to protect the side on which the danger threatened ; and I could not see that either she or the young ones were drawing their sustenance from the leaf on which they were placed. . . .

" This state of things went on till June 23rd, when, on paying my morning visit to my family, I found the young bugs had advanced a stage in life ; perhaps they had moulted, though I could see no cast skins ; but, anyhow, they had become larger and were no longer lying motionless, but moving about very actively, and busily vibrating their antennae. I now counted fifteen in the brood alive, and two that had died and remained sticking to the leaf ; the empty egg-shells were gone, but whether accidentally or purposely removed I cannot say. The mother was now quite in a state of fuss ; she moved about, felt everywhere with her antennae, and, if I attempted to touch her brood, she fluttered her wings rapidly ; but, with all this commotion, neither she nor the young ones moved away from the underside of the leaf, on which they had hitherto been located, for two days longer ; and during this period, if the sun shone out, and the leaf were still, there was a great deal of running to and fro, but at night, and when the wind blew roughly, the mother contrived to get them under her, and sat covering them as at first. On 25th June I found their native leaf quite deserted, and for a minute was afraid that the sparrows had been breakfasting off its tenants, but in another minute my eye caught the mother running on a leaf-stalk, and presently I could count up all the young ones, just setting off on their travels, and scattered about in fours and fives all over the branching twig on which their leaf grew ; they seemed busy exploring, and the mother ran from place to place feeling for them with her antennae."

At this point the little family were taken indoors for closer observation, but unfortunately this experiment was not successful and they soon came to grief.

Mr. Hellins' second observation is that which is detailed on a previous page, and in connexion with this he says, "I do not think the female feeds while brooding over her eggs or young."

The Abbé Pierre found several ♀♀ on the 5th of June, each guarding a batch of eggs; they remained immovable over the eggs and would not be disturbed, clinging tight, although pushed. He states that, at this time, no smell could be observed proceeding from their bodies, but that after they had voluntarily left the eggs on hatching the characteristic smell was again given forth.

Boitard ("Curiosités d'histoire naturelle") makes the curious observation that when a shower of rain comes on the female will conduct her young brood to the underside of a leaf, where, packing them close together, she keeps guard over them till the storm is over. Fabre, however, throws doubt on this observation.

The purpose of this protection of the young must be admitted to be obscure, and the only suggestion is that of Modéer, who says that the ♀ takes her stand over the eggs to protect them from the ♂ parent, as he is ready to devour them whenever he comes across them, but Fabre is inclined to doubt this also.

A similar habit of maternal brooding has been noticed in the Indian bug, *Cantao ocellatus* Thunb. (Scutellerina).

Distribution. *E. griseus*, again, belongs specially to the northern part of the Palaearctic Province, though it spreads over the greater part of Europe. It is one of our most widely distributed species of Acanthosomina. It is recorded from all the coast counties from Yorks round to Cornwall, as well as from Cumberland, Lancs, Notts, Leicester, Warwick, Glo'ster, Oxon, Bucks, Wilts, Berks, Herts, and Surrey. There are no records from Wales, but it is found in both Scotland and Ireland.

37. **Elasmostethus ferrugatus** Fabr. (=Clinocoris id. Osh. Cat.).

Fab. Mant. Ins. ii. 382 (1787); E.M.M. xxxvi. 131.

The eggs and larvae of this species are undescribed, and of its life-cycle I can only say that the imago has been taken in all the months from May to October.

It may easily be distinguished from our other Acanthosomina by having long projecting spines at the posterior angles of the pronotum, longer than those of *A. haemorrhoidale*, although it is a much smaller insect.

Habitat, etc. It has been found on a great variety of plants, such as *Betula alba*, *Crataegus oxyacantha*, *Myrtillus nigra* (J. Sahlberg), *Ribes grossulariata*, *Rubus fruticosus*, *R. idaeus*, *Rosa canina*, *Lonicera xylosteana*. It occurs also in woods, especially of *Coniferae*. Dalla Torre gives roses and red currants as food-plants. According to Schumacher, the food-plant is *Vaccinium myrtillus*.

Distribution. It is found in most parts of Northern and Central Europe and in E. Siberia. Its claim to a place on the British list rests on three specimens only, one taken by Mr. J. W. Carter near Bradford in 1889, one by Mr. E. J. B. Sopp in July, 1899, in the Ogwen Valley near Bangor, where it was swept from low herbage (this specimen is now in the collection of Mr. E. C. Bedwell), and the other by Mr. G. Pullen about the middle of June, 1903, on raspberry in a garden on the outskirts of the town of Derby (E.M.M., xl, p. 38).

38. **Cyphostethus tristriatus** Fabr.

Fab. Mant. Ins. ii. 293 (1787); D. & S., B.H. 105 (1865) (Acanthosoma pictum); Saund., H.H.B.I. 41 (1892).

Ova. The eggs of this species are undescribed.

Larvae. 4th instar, 4 mm. Green, more or less variegated with black and reddish; antennal tubercles red; head large, the part in front of the eyes a truncated triangle, with black margins, narrowly explanate; central lobe extending considerably in advance of side lobes, all of them rounded at apex, sutures black; eyes prominent, no trace of ocelli; pronotum short, very transverse, lateral margins narrowly black and convex, anterior margin concave, posterior convex, disc with a few scattered black punctures in front and at the sides, and a distinct central furrow; mesonotum rather longer than pronotum, posterior margin doubly sinuate; central lobe, representing scutellum, remotely black punctured and with central furrow; wing-pads very short, chiefly blackish-green with basal half of lateral margin black; lateral margin of each abdominal segment with a thin black line externally, and a broader arched one inwardly, enclosing a pale space between them; area of scent-glands red, with a black circle round each opening; antennae stout, four-jointed, basal joint stoutest, green, second longest and greenish, last two sub-equal and black; rostrum long, extending considerably beyond hind coxae; legs green, tarsi black, two-jointed, second joint much the longer, claws abruptly hooked.

5th instar, 6–7 mm. Similar to preceding, but with the following differences: central lobe of face broader in front, but less produced, the black outlines of the sutures continued backwards as two black lines; traces of red ocelli; pronotum longer, more fully punctured and somewhat rugose, hind margin truncate in centre; scutellum distinct and pointed behind, more fully punctured and somewhat rugose; wing-pads not very long, extending a little beyond apex of scutellum, remotely punctured at base, and distinctly margined outwardly.

In the very young larvae the abdomen is very globose.

Life-cycle. The imago matures in August, when also larvae may be found as well as in July ; the adult, however, occurs in spring and through the summer, and I have records for all the months from March to October except May, so that it evidently hibernates as imago.

Habitat, etc. In this country this species is practically confined, so far as present observation goes, to juniper. On the Continent also it most generally occurs on the same shrub, in one or other of its species, but it has been found, in addition, on many other plants, viz. poplars, *Taxus*, *Alnus*, whitethorn flowers, *Sarothamnus*, *Betula*, *Pinus*, and *Abies* (Reuter, 19). Many of these, no doubt, are mere casual occurrences, and there can be little doubt that juniper, or at most some other of the *Pinaceae*, constitutes the true food-plant, on which the young are reared and the life-cycle is enacted. Curtis speaks of finding it on larch trees at the end of August.

Distribution. *C. tristriatus* is distributed throughout the greater part of Europe except the extreme north, of course in suitable localities. In Britain it has been recorded from eleven counties, viz. Kent, Surrey, Sussex, Berks, Wilts, Devon, Somerset, Glo'ster, Oxon, Bucks, and Northumberland. Thus its chief area is a compact district south of the Thames. It is not recorded from either Wales, Scotland, or Ireland. Its distribution is necessarily restricted by that of its food-plant.

Family II. **COREIDAE.**

This is a far smaller family than the *Pentatomidae ;* in the latest catalogue of Palaearctic Hemiptera (Oshanin's) 620 species of *Pentatomidae* are enumerated, but only 170 of *Coreidae*. They reach their highest development, however, both in size and in numbers, in the tropics. Our British fauna contains 21 species, which though so small a number is a considerably larger proportion than we possess of the preceding family. They are a family of more or less elongate bugs with antennae of a stouter structure than any other Hemiptera except the *Aradidae* exhibit, and this character is even more marked in the youngest stages. In some cases, at least, these very strong and robust antennae are used like additional legs, to assist the insect in righting itself if it is overturned. Amongst exotic species one of the most remarkable structural peculiarities is the frequent development of foliaceous appendages to the posterior tibiae, which gives their possessor a most bizarre appearance. No trace of such structures, however, appears in any of our British species, but the development of spines and setigerous tubercles, especially on the head, thorax, and posterior femora, is very characteristic of most of the group. Very little is known of the eggs in this family; some exotic species are oval and shining. Many of the larvae have lateral spines, which they lose when fully grown. Such appendages would make the insects, apparently, difficult to deal with as articles of food, even if they were not distasteful by reason of the usual secretion, and therefore these structures may be protective in function. Dufour considers that the odour exhaled by the *Coreidae* is of a different quality from that of the *Pentatomidae*, though he adds, "il est bien difficile d'exprimer cette différence." The imago has the antennae four- and not five-jointed as in the preceding family; but as the larva has them four-jointed too there is at the last moult no such sub-division of a joint as always occurs in the British *Pentatomidae*.

Most of the *Coreidae* are met with, if we include continental records, from May to October, but several of them have occurred also in the earlier months of the year and in November, thus indicating hibernation as imagines. The only month for which there are no records is December. They are probably mostly vegetable feeders, though very little is definitely known of their habits. Very few of our species can be called common, and several are decidedly rare. They are mainly a southern group; scarcely any are recorded from either Scotland or Ireland, and very few from England north of Norfolk.

The sub-divisions of the family vary somewhat according to different authors, but our British species fall readily into four groups.

According to Tullgren, the auditory hairs are situated in this family as follows: three on each side of the centre of the second and third ventral segments of the abdomen; three on each side of the next two segments about half-way between the median line and the spiracles; and either three or two in a similar position on the sixth segment.

The *Coreidae* possess a dull and not shining surface; they are usually more or less ochreous or brown, and have no metallic coloration.

Sub-family I. **Coreina.**

This division contains ten British species, representing nine genera. Almost all our genera, therefore, are monotypic, so far as the British fauna is concerned, though the case is quite otherwise on the Continent. They are brownish or ochreous insects, sometimes showing brighter colours on the dorsal surface of the abdomen, where these are, of course, normally concealed by wings and hemielytra. As a rule they live on the ground, or on low plants, and their coloration, therefore, is more or less cryptic.

39. **Spathocera dalmani** Schill.

Schill. Beitr., 41, 5, t. 1, Fig. 1 (1829); D. & S., B.H. 122 (1865); Saund., H.H.B.I. 43 (1892).

Ova. The eggs of this species are unknown.

Larvae. 1st instar. Length $1\frac{7}{8}$ mm. Form similar to imago. Head ochreous; thorax red; abdomen ochreous, more or less tinged with red, margins red; scent-glands two, red, very prominent, each on an elevation with two prominences on upper surface; head and abdomen with scattered yellow tubercles, tubercles on thorax concolorous; antennae broad, four-jointed, yellow, apical joint brownish, basal joint tuberculate; legs yellow, tibiae with indications of three brownish rings; tarsi broad, two-jointed, claws minute.

Penultimate instar. Length 3 mm. Ochreous, closely mottled with red, and with yellow tubercles; pronotum transverse, broadest behind, side margins straight, hind margin doubly sinuate; wing-pads short, rounded at apex; scent-glands prominent; antennae four-jointed, yellow, basal joint tinged with red, apical joint obovate, greenish-brown; first three joints with longitudinal carinae, which are spined; legs stout, yellow, femora tuberculate, tibiae with traces of reddish-brown rings; tarsi broad, two-jointed; claws minute.

Last instar. Length 4–4½ mm. Ochreous, closely mottled with red and brown; tuberculate, the tubercles on head and abdomen large and yellow; the rest small and brown; scent-glands ochreous, prominent, semi-circular, with two small prominences on upper surface; wing-pads long, extending beyond first scent-gland; scutellum distinct; legs yellow, with femora spotted at apex, and tibiae with four reddish-brown rings more or less distinctly indicated; antennae yellow, basal joint tinged with red, and apical brown.

Life-cycle. The larvae described above were found by Mr. C. Morley (4) at Foxhall, Suffolk, in late July, and I took some, together with the imago, in August at Farley Heath, Surrey. Douglas met with the imago late in August, and Dr. Power found it on the same spot in May of the following year. Hence the insect evidently matures in August and hibernates in the adult condition. Schilling found it in September and October, and Schumacher (6) in March and April. Thus there are records for the imago from March to October.

Habitat, etc. This insect lives on the ground in dry and sandy places. In August, 1896, I found a colony on a bare part of Farley Heath, Surrey where there was no vegetation but a few scanty tufts of grass. They were lying amongst dead leaves and vegetable débris near the roots of the grass, where they harmonised so well with their surroundings that a close scrutiny was necessary to discern them. The antennae are carried pointing somewhat backwards, and they are used in righting the insect when it is overturned, in the manner described under *Verlusia quadrata*.

Though the natural place for this insect is apparently on the ground, in the open, it has been found also in moss and amongst masses of pine needles, and, as mentioned under *Aelia acuminata*, I have once taken it by sweeping. Douglas, Schilling, and Hahn report it from roots of *Erica*, J. Sahlberg on

Calluna, and Puton on broom. Douglas found it under moss on a sandy hillock at Weybridge. Fieber (2) speaks of its occurring in sandy places under *Artemisia*, and it has been taken in S.W. France in pine trees (Reuter, 19). But this retreat was for over-wintering purposes. Royer records finding a number of specimens, most of which were *in cop.*, on the stems of *Rumex acetosa* L. and *R. acetosella* L., and especially near the flowers. They had the rostrum plunged into the tissues of the plants, upon the juices of which they were evidently feeding. They were accompanied on this occasion by two other species of the genus, *S. laticornis* Schill. and *S. lobata* H. S., neither of which has yet been found in Britain. One other observation is recorded by the same entomologist, viz. that he found two different species *in cop.*, a ♂ of *S. lobata* being paired with a ♀ of *S. laticornis*. The occurrence of these insects amongst the soft parts of the plants instead of on the ground at the time of procreation is interesting, and suggests the possibility that at such a time, when there will be a considerable drain upon their physical resources, a more luscious diet may be needful than would be required under normal conditions.

Distribution. *S. dalmani* is an inhabitant mainly of Northern and Central Europe, and of the Iberian and Italian peninsulas. The British records are from Deal, several of the heaths in Surrey, and Foxhall Heath in Suffolk, a bare and arid tract on which Morley says it is not rare. There is also a record from Staffs. Four counties only, therefore, claim it at present, and Surrey is apparently its head-quarters. It cannot be considered by any means a common insect, although it may be less rare than the observations would seem to indicate, for its sluggishness and its cryptic coloration may lead to its being unnoticed.

40. **Enoplops scapha** Fab. (Coreus id. Osh. Cat.).

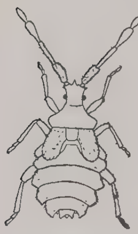
Fab., E.S., iv. 127, 2 (1794); D. & S., B.H. 112 (1865); Saund., H.H.B.I. 44 (1892).

Ova. The eggs of this insect are undescribed.

Larvae. The eggs from the same parent probably hatch at different times, and hence it is often possible to find examples coexisting in all grades of development. This was notably the case with a colony I discovered in August, 1904, in which were specimens of various ages, from very young larvae to the mature insect. Three instars were observable amongst the larvae. In the youngest present, which were probably not the earliest instar of all, the head and thorax are pitchy and the abdomen very pale green. In the centre of the dorsal surface of the abdomen, i.e. the region of the scent-glands, is a brown patch, with two bifid erect spines on the succeeding segments. The lateral margin of each segment ends in a spine in the centre, thus giving a scalloped outline to the abdomen. The whole insect is covered with setae; antennae pitchy, very thick and spinose, the joints increasing in width from the first to the third, which is a broad oval, but the fourth is much narrower; rostrum very pale ochreous with a black tip; legs spiny; front femora very pale ochreous, other pairs pitchy, all the tibiae pale ochreous with six or seven equi-distant dark pitchy bands; tarsi pale at base, pitchy beyond; abdomen flat above and very convex beneath. The fore parts are carried at an angle to the abdomen, considerably raised, and the antennae are spread out sideways.

In the next stage the abdomen is brown, slightly tinged with green, and the bifid spines are reduced to mere tubercles. Lateral margins of the segments angular, the apex of the angle being near the middle of the segment; fore parts paler; antennae very similar to those of the adult, with longer and narrower joints than before. The black bands on the tibiae in this instar have almost disappeared, being represented by circlets of dark spines; sides of pronotum beginning to show the characteristic projections; margins of abdomen deeply serrated.

The third of the instars then observed was the final one in the larval life. The general form in this instar (length 8–9 mm.) is similar to that just described, but the colour is almost uniformly brown, including the wing-pads. The spines on the tibiae simply rise from black spots in front and behind. The tubercles on the upper side of the abdomen have now become white. It is worthy of note that the angulations in the lateral margins of the abdominal segments, which are well marked in all the later instars, disappear entirely at the last moult, for the imago has the sides of the abdomen simply rounded in one continuous curve.



Nymph of *Enoplops scapha* F.

The very young larvae are remarkable for the enormous size of the antennae in proportion to the body; they are both longer and thicker in proportion than in the imago, and the relative size decreases at each moult. In the imago the last joint (4th) is considerably broader than the penultimate, but in the young larvae the penultimate (3rd) is far broader than the last, and is in fact not merely relatively but even actually broader than it is in the adult.

Life-cycle. The eggs must hatch at various times during the summer, and the imagines of the year appear in July and August. They continue to be met with till October, and then they may be seen again in March. Apparently, therefore, the insect hibernates as an imago, and the absence of records for November, December, January, and February is probably due to the absence of collectors rather than of the insects.

Habitat, etc. This is with us distinctly a coast insect; it is usually gregarious, or in other words the individuals yielded by the eggs laid in one spot remain more or less together. E. C. Rye records it as abundant near Folkestone in grassy patches on the hill slopes behind the town, and on the railway cuttings of the S.E. and C. Railway for miles; it also occurs in the

Warren. Hall (3) speaks of it as abundant under the cliffs at St. Margaret's Bay, but as very local, confining itself to a small space of ground. It is also recorded from *Ononis* and from Coltsfoot (H. J. Turner, "Proc. S. Lond. Ent. Soc.," 1897, p. 143). At Yarmouth, I.W., I found the insect common amongst various stout grasses on a very dry bank, and at Trebarwith Strand, Cornwall, they were running about amongst the scantiest and driest of vegetation on the face of the slaty cliffs. The colony above referred to, which I found in August, 1904, at Kimmeridge Bay, Dorset, were congregated amongst luxuriant tufts of *Matricaria* and a few other plants. Schilling reports it as taken in Silesia amongst bramble bushes in spring.

This insect exhibits occasionally oligomery of the antennae. Two examples are recorded in "Bull. Ent. Soc. Fr.," June 27th, 1900, in each of which the left antenna had the third joint entirely missing, while the fourth was abnormally elongated, and its basal third had the colour of the missing third joint, the terminal two-thirds being of the usual brownish colour of the fourth joint (Chabanaud and Royer). Puton reports another similar case. If these irregularities are the result of damage during the larval life a possible cause of such damage is seen in the use made of the antennae as a lever for righting the insect when overturned, and if further it always turns over from the same side, the occurrence of the irregularity in each case on the left side might be accounted for.

Douglas (2) mentions an example of a different kind of malformation; though still on the left side, the first two joints were normal, but the third extremely short and the fourth abruptly anchylosed with the third, so that the junction between the two was not perceptible; the fourth was shorter and smaller than usual, and with the apex obtusely rounded.

E. scapha is but one of a few closely allied species, which differ mainly in the shape of the spiniform antenniferous tubercles. The others, however, belong to S. Europe and N. Africa and are hardly likely to occur with us.

Distribution. *E. scapha* is spread over Central and Southern Europe and Algeria, and extends through Asia Minor into Siberia. In Britain it is found at various points along the south coast chiefly. It has been recorded from the following counties: Northumberland, Durham, Yorks, and all the six counties of the south coast, and in Wales, Glamorgan, and Pembroke. There are no inland records, and none from Scotland or Ireland.

41. **Syromastes marginatus** L.

Lin., F.S. 248, 923 (1761); D. & S., B.H. 110 (1865); Saund., H.H.B.I. 45 (1892).

Ova. The eggs are remarkable for their size and their shape. They are in the form of a spheroid, compressed in outline, and truncated on one side. They are reddish, glabrous, smooth, and sometimes iridescent; under a lens the surface appears dotted or finely shagreened, and this ornamentation, when viewed under the compound microscope, shows as an open network.

This is Dufour's description. Audouin, however, speaks of them as of a beautiful golden colour (Westwood, 1). Kawall, in "Stett. Ent. Zeit.," 1861, p. 127, gives a somewhat different description, saying that a ♀ laid on the 10th June thirteen yellowish-brown, linear eggs, which were smooth and shining, and measured $\frac{3}{4}$ mm. by $\frac{1}{2}$ mm.

Larvae. This larva cannot be confounded with any other, except that of *Enoplops scapha*, which it much resembles, but from which it may easily be distinguished in the last two instars by the presence of a spine at the inner edge of the antenniferous tubercles, and in the earlier ones by its less spiny appearance generally. That of *Verlusia quadrata* is distinguished from both by having its tubercles white, as well as by the shape of the abdomen.

The youngest larva I have seen is probably in the third instar; length of body 4 mm. Colour dark castaneous, with central parts of head and thorax rather lighter; the whole insect covered rather remotely with pitchy setigerous tubercles; antennae four-jointed, very stout, longer than the body, fourth joint shortest and fusiform, first and third sub-equal, third broad and flattened, first prism-shaped, second longest; tibiae ochreous with a red line down the middle interrupted by five or six dark castaneous rings; two areas of scent-glands dark pitchy black, each with two erect and backwardly curved hooks; head square, with a deep transverse sulcature between eyes; antenniferous tubercles ending in a broad blunt prominence; wing-pads quite small; margin of abdomen deeply serrate, each segment running out into a strong point in the middle.

4th instar. Length of body $5\frac{1}{2}$ mm. Similar to preceding in general appearance, but of a more uniform ochreous brown colour, and with the tibial rings only faintly indicated. In this instar the spine at internal apex of antenniferous tubercle is distinct. There is a pale central line down the head and thorax; the wing-pads are much larger and extend to the level of the posterior coxae; pronotum transverse, a little broader than head anteriorly, much broader behind, anterior margin straight, posterior slightly emarginate, lateral margins straight, sloping outwards till near the posterior angles, then suddenly bent inwards, forming a slightly obtuse angle, posterior angles rounded; lateral margins of abdomen less strongly serrate, and the central tooth in each segment less prominent; prominences on scent-glands less hook-like; third antennal joint reduced in breadth.

Last instar. Length of body $8\frac{1}{2}$ mm. Of a uniform dull brown colour, with scutellum darker; spine at inner apex of antenniferous tubercles very distinct; pronotum shaped very much as in adult; middle of tibiae lighter; prominences on scent-gland region straight and less pointed; abdominal margins less serrate; segments almost rounded; antennae still actually thicker than in the adult though thinner than in previous instars, joints in order of their length, beginning with shortest, 4, 3, 1, 2, whole antenna scarcely so long as body; basal area of abdomen almost smooth and alutaceous.

Life-cycle. The imago may be found, apparently, all the year round. There are definite records from April to September, and Dale (2) says in a general way that it is found from September till the following May. I have found larvae in the last three instars, all at the beginning of August. According to Dufour, coupling takes place in July, but Guérin and Péneau say that it occurs in spring. These discrepant observations may possibly refer to two distinct broods, but if so the case appears to be exceptional.

Habitat, etc. This insect is usually taken by sweeping. Morley found it on *Centaurea nigra;* Curtis says it is found on dock; Halbert records it from heaths in S.W. Ireland; Parfitt found the imago under leaves at the foot of hedges. On the Continent Dalla Torre took it on *Umbelliferae* and *Scabiosa;* Mulsant and Rey say that the larva occurs on brambles and gooseberry bushes; Wolff gives rhubarb and dock, and J. Sahlberg *Rubus idaeus.* F. Milton found a specimen sucking blackberry blossom at Tiverton, Devon, September 5th, 1911, but Dalla Torre says it feeds on Aphides. Snellen van Vollenhoven gives *Persicaria orientalis* as a food-plant, and Guérin and Péneau give rhubarb and some species of *Rumex.* They also add that it passes the winter in moss or under dead leaves. Dufour says, "*Il se plait de préférence sur la ronce et sur l'ancholie*" (i.e. for coupling).

In flight it makes a buzzing like that of a bee. De Geer says that it exhales a strong odour of apples, which, however, is disagreeable. According to Dufour, it ejects an excrementitious liquid when irritated. Like *E. scapha*, it has been found suffering from oligomery of the antennae. In one example the terminal joint was missing, and the third slightly lengthened and thickened towards the end, as though the third and fourth had been fused together. In another, the third joint was missing, and the fourth, instead of being entirely black had its anterior portion of the same colour as the second (R. Brown, "Bull. Soc. Ent. Fr.," 1900). In this, as in the cases of *E. scapha* recorded, the abnormality occurred in the left antenna.

Distribution. *S. marginatus* occurs throughout Europe, and its area stretches across Northern and Central Asia to China and Japan; it appears to be generally a common species. In Britain it seems to be far less common than formerly. It is recorded from all the coast counties from Suffolk to Cornwall, and also from Oxon, Berks, and Surrey, in Wales from Carnarvon, Merioneth, Pembroke, and Glamorgan, and from Ireland; but there are no records from Scotland or the North of England.

42. **Verlusia quadrata** Fab. (V. rhombea L., Osh. Cat.).

Fab., E.S. iv, 132, 20 (1794); D. & S., B.H. 116 (1865) (rhombea); Saund., H.H.B.I. 46 (1892) (rhombea).

Ova. Undescribed.

Larvae. In its last instar the larva is sufficiently like the adult in shape and colour to be easily recognised. As in *E. scapha*, each abdominal segment at its lateral margin is angulated, running out into a strong spine. The whole surface above and all the marginal parts beneath are thickly covered with white setose tubercles which also cover the basal parts of the antennae; basal joint of antennae very stout and trigonate; second and third joints flatter and darker, fourth joint quite flat; a short spinous process extends from the head between the antennae; a strong, erect, composite spine rises in front of the scent glands, which are orange in colour; tibiae with two black lines on their edges. Mulsant and Rey say that the larva is pilose; this may apply to the younger stages, but certainly not to the last instar, which as indicated above must be described as tuberculately setose. Wolff says merely "*larva horrida, hispida.*"

Life-cycle. I have found both larva and imago in August, and the imago has also occurred in May and June. Including continental records, it has been met with from March to October. Thus the larvae evidently develop during the summer, maturing in August, and the imagines of the year appear to retire into hibernation in the autumn, reappearing in the open in early spring.

Habitat, etc. In a sandpit near Gomshall, Surrey, in August, 1890, I found a nymph of this species, which I brought home, with the hope of rearing the imago. As it seemed scarcely full-grown, I kept it supplied with the leaves of various kinds of common cottage-garden plants. I had no proof that it touched any of these, except the mignonette, the juices of which on one occasion I found it intently sucking. It remained in captivity about a fortnight before it made its final moult and became a rather thin and weakly imago, and I never saw it take any food save on the above occasion. One use of the enormously developed antennae I had abundant opportunities of noticing. The breadth and thinness of the body are obviously difficulties in the way of the insect's righting itself when capsized, and it is then that the antennae come to the rescue. Pressing their tips against the ground, it supports itself, tripod-like, on them and the end of its abdomen, and then by suitable movements of the antennal props, aided by struggles with the legs, overbalances itself and resumes its normal position. It has also the curious habit of occasionally raising its body from the depressed position in which it is usually carried, and swaying it from side to side while thus slung up, as it were, between the three pairs of legs. I could discover no reason for this peculiar movement (Butler, 11). The two specimens which I took on the mound referred to under *Aelia acuminata* were exceedingly lively and ready to use their wings. The extreme heat of the day may have had something to do with this.

It is usually taken by sweeping. Douglas and Scott (1) say it occurs on various trees and shrubs in autumn.

Distribution. *V. quadrata* occurs over the greater part of South Europe and extends into Western Asia and North Africa. It is by no means common in Britain, and is restricted in distribution. North of the Thames it has occurred only in Suffolk, Essex, Oxon, and Bucks. Its chief home is the counties south of the Thames, in all of which, including Somerset, it has occurred except Sussex and Wilts. There are no records from Wales, Scotland, or Ireland. I have found it common in Jersey on the sandhills.

43. **Gonocerus acuteangulatus** Goeze.

Goeze, E.B. ii, 242 (1778); D. & S., B.H. 114 (1865) (venator); Saund., H.H.B.I. 47 (1892) (venator).

Ova. Unknown.

Larvae. The nymph has the fore parts of the reddish-brown colour of the adult, but the abdomen is bright green, and, as usual, broader than in the imago. The whole upper surface is covered with small scattered pitchy brown tubercles, from each of which springs a minute yellowish seta. On the antennae the tubercles are larger and placed more thickly, and the setae are longer; legs covered with minute tubercles from which spring blackish hairs; scent-glands indicated by three pairs of pitchy spots, each pair placed on an oval disc, which is bounded outwardly by two other pitchy spots. The cast skin shows no trace of the green colour, and only slight traces of the brown of the fore parts; but the tubercles are very distinct.

Life-cycle. I have beaten the box trees in August in order to secure this insect, and after many hours' very hard work I was able to secure three nymphs. They were nearly full-grown, so I kept them supplied with fresh box twigs, and all became imagines early in September. E. Saunders took the imago in July and August, and Jennings (1) in August; but as I have taken an adult in June and Douglas (2) also took it in May, it evidently hibernates as imago. The latter observer speaks thus of its occurrence at Box Hill: "Twice, at a long interval, during fifteen years, I have taken a single example by beating the box trees on Box Hill in May; but, although I have beaten about the bush nearly every May, and also in other months, these two were all that rewarded my diligence. Still, it would be hazardous to say that the insects have not been there during any of those seasons, knowing, as we do, how many fortuitous circumstances must often happen together to enable an entomologist to find some particular species. Be this as it may, it is certain that on the 23rd inst. (May, 1865) I was lucky enough to get eight ♂ and eight ♀ of this coveted beauty." Mr. E. C. Bedwell has been even more successful in the capture of this insect at Box Hill. It has also been taken in October. Thus the life-cycle seems to be similar to that of the rest of the *Coreidae* thus far considered.

Habitat, etc. In this country this species, when adult, is confined to box trees, though on the Continent it is found on oaks and the dog rose. Douglas says that " they affect the shoots that stand out from the bushes, and are fond of sitting on the top of them in the bright sunshine and taking short flights from one to another ; and when one is in the net you are not sure of him, as he has a strong propensity to fly out of it." Bedwell has found the larva in some numbers on yew trees, in which the attraction seems to be the berries, which he has seen them sucking. Schilling says that he took it amongst oak trees. Populus quotes Robineau-Desvoidy to the effect that the larva lives on *Rhamnus frangula.* Two other species closely allied to this occur on the Continent, but are less widely distributed and belong on the whole to the more southern parts. They are *G. juniperi* H.S., which inhabits juniper, and *G. insidiator*, from *Arbutus* and Mastick. They are scarcely likely to occur in Britain, but they might easily be passed over as *G. acuteangulatus* by those who are not very familiar with the genus.

Distribution. *G. acuteangulatus* is found in the central and southern parts of Europe and some of the western parts of Asia ; in Britain it is, so far as known, confined to one spot, the extensive grove of box trees which grows on the downs at Box Hill.

44. **Pseudophloeus fallenii** Schill.

Schill. Beitr., 46, t. 1, Fig. 2 (1829) ; D. & S., B.H. 124 (1865) ; Saund., H.H.B.I. 48 (1892).

Ova. Jennings (7) says that a ♀ which he obtained at Deal on August 18th, 1900, laid ten eggs in the box in which it was placed ; they were oblong, whitish, semi-transparent, about 1 mm. long, and smooth, even under a lens.

Larvae. The larvae are pale ochreous, with more or less of a beautiful pink tinge when they are quite young.

Life-cycle. During August, on the sandhills of Carmarthenshire, I found larvae in all stages, including some very young ones, apparently only just hatched. These very young ones were in close association with one very pale adult, but whether they were its family or not I cannot say. The insects appear to mature chiefly in August, and the imagines may be found in that month and September. The above record by Mr. Jennings of oviposition after the middle of August represents that function as evidently later than the usual practice, which would probably be at some time in July. Morley (4) records the imago as occurring in June in the Breck district, Suffolk, and I have found it in the early part of that month at Deal, together with dead and damaged specimens. Bedwell records it from Deal in May, June, August, and September, and De la Garde took it in

Devonshire in March. Hence it evidently hibernates as imago. Including continental records, it has been met with from March to October, but evidently the hatching period extends over several weeks.

Habitat, etc. In habitat and habits this insect resembles *Spathocera dalmani*. It frequents sandhills, where it may be found under *Erodium*, or lying about in the open spaces which are more or less encumbered with small fragments of vegetable débris. Its coloration so closely approximates to that of the sand on which it is lying that the detection of the specimens is by no means easy until they begin to move. A black variety is occasionally found (Hall, 3). Schilling records the imago from under *Genista tinctoria*, and it is reported from the Continent also under *Filago*, and on the borders of woods. Dalla Torre quotes it from *Cytisus* flowers. In this country it is chiefly a sandhills, and therefore a coast, species. There is no definite evidence as to the nature of its food. Curtis describes it as beaten off thistles and nettles on sandhills.

Distribution. *P. fallenii* occurs in Central and South Europe and in N. Africa and the Canary Is. In Britain it has been taken in five English and three Welsh counties, viz. Norfolk, Suffolk, Kent, Surrey, Devon, Glamorgan, Camarthen, and Pembroke. The Surrey locality is Weybridge, but all the others are the sandhills on the coasts of the respective counties. In S. Wales it is particularly common, generally associated with *Erodium*. On the Continent it is by no means confined to the coast. It is not recorded from either Scotland or Ireland.

45. **Pseudophloeus waltlii** H.S.

H.S. Faun. Germ., 127, 6 (1834); E.M.M. xxxviii, 80.

This species is closely allied to the preceding, but differs in having the third antennal joint widened and black at the apex, the scutellum carinated only at the apex, and the antennary tubercles pointed instead of obtuse. It is usually a little larger and darker.

I have no information about the eggs or larvae of this species.

Life-cycle. The imago has been taken from May to August.

Habitat, etc. It has been found at the roots of grass in a very dry place at West Walton, Norfolk, and under *Erodium* on sandhills at Caldecott, near Fritton, Suffolk. The former habitat, if usual, is perhaps enough to account for its having remained so long unnoticed amongst us.

Distribution. On the Continent it has a very similar distribution to the preceding, but its claim to a place on our British list depends at present upon three records, the Norfolk specimen referred to above, which was found by Mr. Thouless (3) on August 5th, 1901; the Suffolk specimen taken at Caldecott near Fritton by Mr. C. Morley on May 19th, 1919; and two specimens in the Cambridge University Museum taken at Mildenhall.

[Mr. Bedwell has recently taken other specimens in the same corner of East Anglia.]

46. **Bathysolen nubilus** Fall.

Fall. Mon. Cim., 58, 4 (1807); D. & S., B.H. 125 (1865); Saund., H.H.B.I. 49 (1892).

Of the early stages of this insect I have no knowledge.

Life-cycle. From April to November and February it has been found on the Continent mainly in moss under juniper, but in October on juniper itself (Reuter, 19). These records seem to imply hibernation as an adult, with a probable maturation of the new generation towards the end of the summer. Guérin and Péneau speak of it as occurring in damp meadows in September.

Habitat, etc. This is a very rare species with us, but on the Continent it is found in sandy places, on hills and the margins of fields, under various plants, and also beneath hazel bushes under the dead leaves, and beneath junipers amongst moss; Schilling found it at roots of *Artemisia campestris*. Insects such as this, which live habitually at the roots of grass and other plants, of course easily escape observation unless they are very common; and therefore it is quite possible that this particular species may not really be so rare as it seems. It does not appear, however, to be common anywhere, even on the Continent. The above record of its occurrence in a juniper bush is peculiar, as it is essentially a ground-lover; probably it was on the juniper for hibernation.

Distribution. Though distributed through Central and Southern Europe and in Egypt and Turkestan, this insect has hitherto been discovered in two British counties only, Norfolk and Kent, and in fact no more than three or four British specimens are known to exist. One, probably from Deal, passed *ex coll.* Harding into that of E. Saunders; J. Edwards (1) records two others, one taken by F. Norgate and one by himself, the latter a dead one found "at the roots of grass in a lane off Unthanks Road," Norwich; Douglas and Scott (1) record one from Deal, and one was taken at King's Lynn, Norfolk, June, 1902.

47. **Ceraleptus lividus** Stein.

Stein. B.E.Z., 2, 75, 3 (1858); D. & S., B.H. 127 (1865) (squalidus); Saund., H.H.B.I. 50 (1892).

Of the early stages of this species, again, no information is available.

Life-cycle. The imago has been taken in February (Billups, 2), from March to May, and from July to October. These records seem to point, as usual, to the hibernation of the imago.

Habitat, etc. This species, although by no means so rare as the two preceding ones, is yet not at all common. It is sometimes obtained by sweeping (see under *Aelia acuminata*); Champion and T. R. Billups also took it in this way. The latter also found eight specimens at the roots of *Festuca pratensis* on the railway bank at Chobham, Surrey. This was in February, 1885 (see above), and the insects had evidently taken up winter quarters there, as so many others do. Many species of apterous *Ichneumonidae* were its companions in this retreat. Commander Walker picked up one specimen of this bug in a road at Woking (Champion, 7). But by far the largest number of specimens have been taken in moss on sandhills, especially at Deal and at Camber, Sussex. At the latter locality E. P. Collett (5) and H. G. Henry took sixteen specimens in moss on October 3rd, 1882, and this is the largest number that have occurred on any one occasion.

When I swept this species at Albury, as recorded under *Ælia acuminata*, I found it active in the net; this, however, may have resulted from the excessive heat of the day, as a high temperature seems to have an invigorating effect upon the larger Hemiptera. Douglas, on the other hand, speaks of it as a sluggish species, instancing the following in proof: he was hunting Hemiptera at Deal, on the top of the hillocks of the sandhills amongst the grass bents under the lowest branches of the dwarf sallows. Both *Ceraleptus lividus* and *Verlusia quadrata* turned up together, the former being on its back; it took so long to turn over that the *Verlusia* had time to crawl all the way up the captor's arm before the *Ceraleptus* had righted itself. *Verlusia* would certainly have accomplished the feat more quickly, notwithstanding its greater breadth.

On the Continent it is said to occur on oaks and conifers (Guérin and Péneau).

Distribution. The area of *C. lividus* is Central and Southern Europe. In Britain it has a very restricted distribution, being recorded from four counties only. These—Essex, Kent, Sussex, and Surrey—form, as will be seen, a compact area in the S.E. of England.

48. **Coreus denticulatus** Scop. (Coriomeris id. Osh. Cat.).

Scop. Ent. Carn. 125 (1763); D. & S., B.H. 118 (1865) (hirticornis); Saund. H.H.B.I. 51 (1892).

Although this is the commonest of the Coreina, I have no records of the earlier stages.

Life-cycle. The imago may be obtained in August, but it is also recorded from Headley Lane in January (Billups, "Proc. Ent. Soc. Lond.," 1885, p. iii), from Mickleham in April, from the New Forest in May, and from Suffolk in June, thus proving the hibernation of the imago. Douglas and Scott (1) record it in July, and there is also a record for October.

Habitat, etc. It occurs sometimes on the ground in the same way as *Pseudophloeus fallenii*, but is more commonly obtained by sweeping. Like most of the larger Hemiptera, it seems to be commoner during very hot summers, or at any rate it is more in evidence then. In the very hot and dry summer of 1899 I found it extremely common in August in the neighbourhood of Gomshall, Surrey, far more so than ever before or since, either there or elsewhere. Sunshine and excessive heat increase the activity of this and other species. E. C. Rye speaks of it as abundant on all kinds of plants at Folkestone among grassy ditches on the hill slopes, and all along the railway cuttings for many miles. Douglas and Scott found it on thistles by the roadside in July, and by sweeping grasses and in moss in August. Collins reports it as taken freely in clearings in fir plantations.

There are several continental species closely allied to this, but they are chiefly more meridional in distribution and are hardly likely to occur with us.

Distribution. This insect occurs throughout the greater part of the Palaearctic Region, but not in the extreme north, and in Britain is recorded from all the coast counties from Lincs round to Glo'ster, as well as from the inland counties of Warwick, Worcester, Oxon, Bucks, Berks, and Surrey But it does not seem to be common in the more northerly of these counties. There are no records from Wales or Scotland, but it occurs in Ireland.

Sub-family II. **Alydina.**

A small group of long-bodied, long-legged, and very active bugs, of which only some seven or eight species are European. In Britain we have one solitary representative of the group, and no others are likely to be found here. The habits of our British species cannot be taken as any guide to those of the group as a whole, which includes a species very troublesome to the rice growers of India.

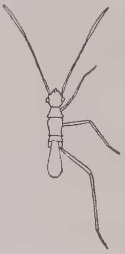
49. **Alydus calcaratus** L.

Lin., F.S. 968 (1761); D. & S., B.H. 143 (1865); Saund., H.H.B.I. 52 (1892).

Ova. I do not know the eggs of this insect, but a brief description of those of an allied species, *Riptortus linearis* L., is given by Kershaw and Kirkaldy ("Trans. Ent. Soc. Lond.," 1908, p. 61) as follows: "Cauldron-shaped, dark bronzy-brown, sometimes slightly dusted with a whitish waxy substance (like that on most Hesperid pupae). There is no special cap." On the other hand Capt. Xambeu gives the following description of another allied species (*Camptopus lateralis*, Ger.): "Oeuf. long. 1 mm. diam. 0.5 mm. Ovoide vert clair de pré, lisse et luisant, finement pointillé, à pôles arrondis, à coquille assez résistante." The green colour is lost before hatching.

Larvae. The larvae are very ant-like in appearance, especially in their youngest stages. In a specimen I have which measures 3½ mm. in length, and is probably in the second instar, the head is very broad, broader in fact than any other part; it is rounded behind, and the eyes are very prominent; face long, triangular; the rest of the body narrow and parallel-sided, with trapezoidal pronotum having the posterior angles distinct and upturned; the whole insect of a dark blackish-brown colour, relieved by a delicate yellow line running down the middle of pronotum and mesonotum; head covered with long, stout, white bristles ; similar bristles, but much smaller, scattered over the rest of the body ; antennae four-jointed, and proportionately stouter than in the adult ; legs rather long ; there is no trace whatever of the spines on the hind femora which have suggested the specific name *calcaratus ;* these scarcely appear as such till the last moult ; both antennae and legs uniformly coloured dark chocolate-brown ; tarsi long, two-jointed, with basal joint much the longer of the two.

I have seen several young larvae found by Mr. Donisthorpe in ants' nests at Weybridge. The smallest of these measured only 2 mm. and was probably in the first instar. It had shrivelled so much in drying that details of form could not be made out, but the basal joint of the hind tarsi was very conspicuously pale. A larger specimen, of 3 mm. and probably representing the same instar, resembled the specimen described above, save that there were no angles to the pronotum, and that the basal joint of the hind tarsi was yellowish-white, except at the extreme base and apex. The next specimen, measuring 4½ mm., showed the posterior angles of the pronotum now distinct and upturned; the fore parts were brightly coloured inclining in places to scarlet, and the hind tarsi were variegated as before. The next specimen, measuring 6 mm., represented a considerable advance. In shape it was similar to the smaller ones, but the pronotum had its posterior angles produced laterally. The colour was much brighter, red in front ; scutellum bright ferruginous, with crimson upturned point at apex ; wing-pads present, small, not extending much beyond level of hind coxae ; metasternum and base of abdomen crimson ; the former with five longitudinal white stripes separated by fuscous stripes ; the central white stripe ending behind in a slightly upturned spine ; whole body scantily furnished with whitish setae, longest on head and next in size on abdomen ; spines of hind femora represented by three or four blunt tubercles, not conspicuous. These larvae all had a very delicate skin which had shrunk in many places ; possibly they had but recently moulted, and if so the colours would probably be brighter than they would have become when the skin hardened.


Young Larva of *Alydus calcaratus* L.

A still larger larva, measuring 8 mm., taken by Mr. A. Hamm in the New Forest. Head shaped as in imago, but not punctured, with long hairs, white in front and black behind ; pronotum trapezoidal, unpunctured, ferruginous brown, with pale central line bordered with black in front ; lateral margins black ; wing-pads dark ferruginous margined with bronze-brown, with a few scattered white hairs ; scutellum dark ferruginous with a fine pale central line, bordered with dark brown, apex yellow, somewhat upturned and slightly bifid ; legs and antennae only feebly hairy ; abdomen with basal segment ferruginous, second velvety black, with white margin posteriorly; third with two velvety black patches; fourth and fifth carrying a small hump anteriorly; hinder part of abdomen very convex both above and below, basal part very depressed; hind femora with two or three minute spines at intervals; tarsi two-jointed, claws with arolia. The peculiar shape of the abdomen of course increases the ant-like appearance.

The following is Reuter's description of a larva $3\frac{1}{3}$ mm. long: "Castanea, supra pilis rigidis erectis pallidis; capite fusco-castaneo, fere ut in imagine constructo, sed pone oculos longius constricto, his fere in medio laterum capitis positis, rotundatis; ocellis nullis; antennis corporis fere longitudine, articulis tribus basalibus rostroque rufo-ferrugineis; hoc articulo primo capite duplo breviore; articulo primo antennarum apicem clypei subattingente, basi pallido, secundo hoc paullo longiore, tertio secundo nonnihil breviore, quarto crasso, leviter arcuato, duobus praecedentibus conjunctis aeque longo, fusco-castaneo; thoracis segmentis capite circiter $\frac{1}{3}$ angustioribus, omnibus aeque latis et longitudine subaequalibus, fusco-castaneis, linea longitudinali percurrente lineolisque apicalibus metanoti quinque pallidis flaventibus, metanoto utrinque lateribus rufescente; abdomine thorace parum longiore, ovali, basi constricto ibique thorace paullo angustiore, medio hoc saltem dimidio latiore, unicoloriter fusco-castaneo; pedibus castaneis, basi articuli primi tarsorum posticorum albo; femoribus posticis omnino muticis."

Life-cycle. The records for the occurrence of the imago are confined to June, July, August, and September. The larvae above described were taken in July and August. The eggs probably hatch about the end of June or beginning of July, but there is no evidence as to when oviposition takes place. The eggs of the *Riptortus* above mentioned were laid at the end of September, and the adults appeared in less than a month; but this is an Oriental species, and the seasons in the East are so different from what we are accustomed to in the more temperate latitudes, that these dates cannot serve for *A. calcaratus*. The eggs of *Camptopus lateralis*, a Palaearctic species, laid in July and received from France hatched some eight or ten days after laying.

Habitat, etc. *A. calcaratus* is exceedingly active in its movements, running on the ground and flying with equal facility; it delights in the hot sunshine, and may be found on heathy commons, running about on the bare ground after the fashion of an ant, readily taking alarm and seeking safety by the use of its wings. In the island of Guernsey J. E. Mason found it on furze; Saunders records it from broom and *Ononis*, and Douglas from *Ulex nanus*. On the Continent it is found on *Medicago sativa*, *Genista*, *Cytisus*, and according to Burmeister on *Euphorbia*, and Reuter (13) on *Artemisia;* Dalla Torre and others mention also clover. It delights in sandy ground, and the broad sandy heaths of Surrey seem to be particularly attractive to it. The larva, when at rest, carries its antennae sloping obliquely backwards.

Great interest attaches to the association of this insect with ants, especially as it is accompanied by the strongly ant-like appearance of the larva. Nothing, however, appears to be known regarding the nature of its relations with the ants, nor the purpose served by the mimicry. The small larvae might very easily be mistaken for ants, but although the larva in its last instar is almost more ant-like, it is at this stage much too large an insect to be confounded with any British species of ant. This consideration, however, would not apply to the Continent, where the large ants of the genus *Camponotus* can well match it, and even surpass it in size. It does not seem to be confined to any one species of ant, but has been found with several. Both here and on the Continent it is sometimes associated with *Formica rufa*, but the majority of recorded instances in Britain refer to other species. Donisthorpe took it with *Formica rufa*, with *F. sanguinea* at Woking, with *F. fusca* in the New Forest and the Isle of Wight, and with *Acanthomyops niger* in the Isle of Wight, those in the Isle of Wight being in all their stages. Reuter speaks of its occurring with a *Myrmica*.

Distribution. It is distributed throughout the Palaearctic Region, and even extends into the northern parts of N. America. In Britain it is recorded from all the littoral counties from Norfolk to Cornwall except Suffolk, as well as from Surrey, Berks, and Yorks, in which latter county it has been found at Scarborough. In Wales it is recorded from Merioneth and Glamorgan, but besides the above from Scarborough, there are no records from the North of England nor any from Scotland or Ireland.

Sub-family III. **Stenocephalina.**

A group represented in the Palaearctic fauna by one genus only, of which eighteen Palaearctic species have been described. These unspined bugs have a common facies, from whatever quarter they may come. They are less active than the Alydina, and are closely associated with the *Euphorbiaceae* or Spurges.

Our three British species may be thus distinguished :

(i) Hairs on legs long ; rostrum reaching to intermediate coxae.
  (*a*) Second joint of antennae with dark ring near the base ; femora with long hairs, which are not erect. Length 12–13 mm. *agilis* Scop.
  (*b*) Second joint of antennae without dark ring near the base ; femora with long hairs, which are erect. Length 10–11 mm. *albipes* F.

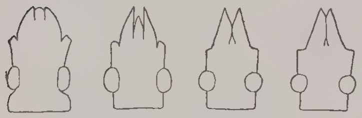
(ii) Hairs on legs short ; rostrum reaching to posterior coxae. Length 8–10 mm. . . . . *medius* M. & R.

50. **Stenocephalus agilis** Scop.

Scop. Ent. Carn., 126, 366 (1763) ; D. & S., B.H. 141 (1865) ; Saund., H.H.B.I. 53 (1892).

Ova. Eleven eggs taken from the body of a ♀, and most of them apparently quite ready to be laid, measured 2 mm. in length ; reddish-yellow, rather broad, cylindrical, rounded at one end, and at the other, which is flatter, though not truncated, a circle of seven very short cylindrical processes, enclosing a cluster of equally short upright spines ; chorion smooth, shining, and without markings.

Larvae. The youngest larvae, in the first instar, have the body parallel-sided and almost black, with the abdomen slightly reddish and the legs pale ; antennae stout, especially first and fourth joints, the latter much the stoutest and longest, the intermediate joints with basal part white and apical red ; central lobe of face as long as side lobes. Length at first just over 1 mm.


Head of *Stenocephalus agilis* Scop. in successive instars.

In the second instar the body becomes slightly obovate, and is at first pink, with a few white spots ; the head has the two side lobes very stout, bluntly pointed and deeply separated, much more so than in the adult ; they now stretch farther forward than the central lobe ; legs pale yellow, except the last tarsal joint, which is reddish ; antennae with basal joint red and very stout, second yellow with extreme apex red, third dark red with yellow base, second and third hairy, especially third, fourth rather stouter than the rest, deep red, with extreme base yellow ; the hairs on the legs, which are so conspicuous in the adult, are here fine and pale and almost invisible. Length 3½ mm.

In the third instar the body is still obovate and brownish-red in colour ; side lobes of head still strong, but not so deeply separated as before, passing far beyond central lobe ; legs yellow, tarsi brown, antennae marked as in previous instar, but deeper coloured, third joint considerably stouter ; two pairs of scent-glands marked at each side with an oblique yellow line. Length 5 mm.

In none of these instars is there any trace of the banding of the legs which is so conspicuous in the adult.

In the fourth instar the wing-pads begin to appear ; fore parts brownish, abdomen reddish, legs testaceous, more or less infuscated ; central lobe of head completely imbedded between side lobes ; surface like that of fifth instar, but the hairs shorter ; third antennal joint stout and almost entirely dark.

In the last instar, 10½ mm., the shape is very similar. Fore parts coloured as in adult, abdomen above reddish, darker in the centre. Whole upper surface delicately shagreened, and with very short yellowish hairs scattered extremely scantily over it; pronotum trapezoidal, with distinct side margins; antennae stouter than in the adult, especially the third joint, which is almost entirely dark; knees and tarsi rather dark, but neither in legs nor antennae is there such a marked distinction between the pale and dark parts as in the mature insect.

In all the instars the terminal joint of the antennae remains with fine adpressed hairs.

Life-cycle. The eggs certainly do not all hatch at the same time. I have found all stages, from the very youngest larvae to the imago, all together in the month of August. The majority seem to mature in August. The imago has been found in all the months from March to November; according to Reuter (19) it has occurred in March by beating pine trees, and it over-winters in moss, etc. As the ♀ has a well-developed and almost straight saw the eggs will no doubt be inserted in the tissues of some plant, probably a *Euphorbia.*

Habitat, etc. This is with us almost entirely a coast insect, and I have generally found it associated with littoral species of *Euphorbia*, such as *E. portlandica;* it is recorded also from *E. cyparissias.* On the Continent it occurs also under juniper and *Erica*, and I have found it in Jersey at the roots of reeds by the seashore. E. R. Curzon found it commonly at Newtown, Bridgend, S. Wales, but it occurred, not under the spurge, though that grew there commonly, but at the roots of the "mat-grass" on the sandhills. E. C. Rye records it from among large stones in grassy places, at the base of the cliff at Folkestone, and Linnell found it under stones in Surrey. (This may have been *S. medius.*)

At St. Ishmael's, Ferryside, Carmarthenshire, I found in August, 1909, a large nursery of this species. They were associated with a tall species of *Euphorbia* (apparently *E. paralias*), which grows luxuriantly on the seashore in the neighbourhood. There was one adult, and with her a large number of larvae which were in first, second and third instars. The locality was just where the sandhills shade off into a beach of large boulder like pebbles; the *Euphorbia* was growing amongst these, and the larvae were seen, not on the plants, but running about amongst the heavy flints. As the larvae are exceedingly fragile and delicate the spot would seem to be a most unsuitable one for them; the slightest movement of the big stones amongst which they were living might easily have crushed them. None were to be found *on* the plants; the youngest larvae were *beneath* them, but as they get older they evidently become bolder, for the later instars were running about amongst the boulders at some distance from the plants. There was only one adult with them, but whether this was her brood and she was in any sense "looking after them" I could not determine. It was curious to find none of the insects *on* the plants, where, if these were really food-plants, one would have expected to see them; and yet there seemed to be nothing they could feed upon amongst the boulders.

Mr. Newbery has a specimen from Portland which shows a peculiar oligomery of the antennae ; the left antenna has only three joints, the second being much longer than usual, and representing both second and third.

Distribution. This species occurs throughout the greater part of Central and Southern Europe, and extends into Asia Minor and Siberia ; it is found also on the N. African coast. In Britain it is mainly a littoral insect, having been recorded from the coast counties from Essex round to Cornwall, and also from Surrey. There are also records from Worcester and Glo'ster, but these may perhaps refer to the next species, which has only recently been distinguished in this country from *S. agilis*. In Wales *S. agilis* has been found in the three southern counties, Glamorgan, Carmarthen, and Pembroke ; these all contain extensive sandhills where the littoral *Euphorbiae* grow—an ideal haunt for *Stenocĕphalus*. The most northerly record is from Lancs, where a specimen was found in an office at Liverpool. There are no records from Ireland, and only a very doubtful one from Scotland. It is distinctly a southern insect, and with us also practically a littoral one.

51. **Stenocephalus medius** M. & R.

M. & R., H.N.P.F. Cor. xc. 248 (1870) ; E.M.M. xlvii, 134.

From our other two species it may be distinguished by the following characteristics : Its average size is smaller, and the body is proportionately broader behind ; legs and antennae shorter ; basal joint of the latter shorter and stouter, basal yellow ring on the apical joint smaller, and the proximal dark ring on the second joint obscure and brownish ; hairs on the legs short and far less conspicuous ; rostrum longer, reaching posterior coxae.

Ova. These are thus described by Xambeu : "Long. 1.6 mm., diam. 0.4 mm. Oeuf allongé, subcylindrique, brunnâtre, très imparfaitement pointillé à pôles, l'un en pointe arrondie, l'autre un peu moins ; ce dernier ceint d'un cercle de cinq ou sept petites et courtes épines rougeâtres ; à coquille résistante."

Larvae. The following is a description of a nymph in the final instar which I took amongst long grass at Maidenhead Thicket, Berks, on August 8th, 1893. Obovate, entirely purplish-brown, mottled with ochreous ; extreme apex of scutellum yellow. In the region of the dorsal scent-glands are two abdominal bands, each consisting of two ochreous spots outlined with black, and a fuscous patch between ; base of all the femora yellowish ; tibiae yellowish, stained with fuscous, especially at apex ; antennae with first joint black ; second joint with basal half yellowish, apical half and extreme base black ; third and fourth joints black with base whitish ; rostrum with basal half ochreous, apical black. A few days after its capture this specimen produced a ♂ imago. The cast skin shows all the dark parts of the legs and rostrum, whilst that part which covered the body is of a uniform greyish-brown.

Life-cycle. Copulation takes place in May, when the flowers of *Euphorbiae* open, and apparently the eggs, some twelve to sixteen in number, are laid at once at intervals along the stems of the plant. After eight or ten days the eggs hatch, and from that time the insects remain closely connected with and dependent upon the plant upon which they first saw the light (Xambeu). The imago has been found in May, June, August, and October, and as the larva mentioned above matured in August it would seem that those specimens found in the earlier months must be over-wintered ones.

Habitat, etc. I have found it amongst long grass, and in this country, apparently, it always occurs inland, while *S. agilis* belongs strictly to the coast. Although this insect has shorter legs than *S. agilis* it has a longer rostrum, and it would be interesting to know whether there is any difference in the method of feeding to account for the altered proportions. For the introduction of this insect to the British list see " Ent. Mo. Mag.," xlvii, p. 134. The note I have given in " Ent Mo. Mag.," xxxi, p. 76, entitled " An aberrant (?) form of Stenocephalus agilis, Scop.," refers to this species.

According to Guérin and Péneau it occurs on oaks in May and June.

Distribution. Besides England, this species has been recorded from Central Europe, Italy, Asia Minor, and Turkestan. Not improbably it may have been overlooked in other parts, as it is so closely allied to *S. agilis*. So far as our own country is concerned it has hitherto been found in Kent (Darenth Wood, several specimens in Power Collection), Berks (Bulmershe and near Maidenhead), Oxon (Wytham Park), Worcester, and Glo'ster. To this list may now be added Sussex, as I have had the opportunity of examining the specimen taken by E. P. Collett in Hollington Wood, near Hastings, which is now preserved in the Manchester University Museum, and which was originally recorded as *S. agilis*. It turns out, however, to be *S. medius*. It has also been taken in Devon by T. Edmonds. Thus the insect is entirely a southern species.

52. **Stenocephalus albipes** Fab.

Fab. Spec. Ins., 382 (1781) ; D. & S., B.H. 142 (1865) (neglectus) ; Saund., H.H.B.I. 54 (1892) (neglectus).

I have no information about either the early stages or the life-history of this species, save that it has been found on the Continent in July. It lives under *Euphorbia*, Mulsant and Rey giving the species as *E. gerardiana*, which is not a British plant.

Distribution. This species belongs chiefly to Central and Southern Europe, but its area passes into Asia Minor and Syria. Its claim to a place on the British list is a dubious one, resting only upon two or three ancient records. The localities also are vaguely given as the coasts of Devon and Cornwall, and the New Forest. I know of no recent captures.

Sub-family IV. **Corizina.**

The broader bodies, shorter legs, and prominent eyes of most of these insects give them an easily recognisable facies; *Chorosoma*, however, is aberrant in these respects. Forty-five Palaearctic species are catalogued by Oshanin, of which we possess only eight or nine, and several of these are of rare occurrence. It cannot be said that we have much definite evidence of the food of the *Corizi*. Lefroy says of an Indian species, *C. bengalensis* Dall., that it is, at least in part, plant feeding, extracting the sap and mucilage of its food-plant (*Hibiscus esculentus*).

53. **Therapha hyoscyami** L.

Lin., F.S. 945 (1761); D. & S., B.H. 129 (1865); Saund., H.H.B.I. 55 (1892).

Ova. These are red and oblong. (De Geer.)

Larvae. The young larva is noted for the disproportion which appears in its appendages. The antennae are longer than the body, and of considerable thickness; the legs, which are hairy like the antennae, are also disproportionately large; and the rostrum is of extraordinary thickness and length, extending beyond the end of the body. The fore parts are black, and the body red, and the whole is pubescent; legs and antennae reddish-brown (De Geer).

I have taken the nymph on *Ononis* in S. Wales. It may easily be distinguished from all the previous *Coreidae* by its hairy condition. It is pale ochreous, thickly spotted with pink; wing-pads dark ochreous, spotted with brown, and there is a pale line down the middle of the head and pronotum; last joint of antennae dark. It will be seen, therefore, that the brilliant scarlet of the imago is not indicated in the nymph, except as a faint suggestion in the form of the pink spots. The whole of this brilliant coloration is taken on at the last moult. The whole insect is covered with black punctures, which are more scattered on the underside. In shape, it is similar to the imago, but the head is longer and the eyes smaller, and the antennae and legs are proportionately shorter and stouter.

J. Sahlberg gives the following description of the larva: "nigro-fusca, rufo-variegata, satis fortiter nigro-setosa, segmentis singulis abdominalibus lateribus spinulo flavo armatis."

Life-cycle. The eggs are laid in June, immediately after the fecundation of the ♀ (De Geer). The larvae may be found in July and at the beginning of August. Late in August the imago appears, and it lasts through September plentifully and in good condition. A nymph which I captured in August, matured after a captivity of ten days; but as there was some difficulty in keeping it supplied with suitable food, the last ecdysis was probably unduly retarded. It hibernates in moss and on junipers and pine trees. There are records of the capture of the imago in all the months from March to October, and also in January.

Habitat, etc. I have found it abundant on the sandhills of Carmarthenshire, especially in the neighbourhood of Pendine. Here it occurred running on the ground, especially amongst *Erodium*, but it could also be obtained abundantly by sweeping the flowers of ragwort (*Senecio jacobaea*). I have found it also under *Ononis*. Curtis speaks of its occurring in various Devonshire localities on thistles and rest-harrow, from May 20th to July 1st. These would evidently be over-wintered specimens. Commander Walker found it in Cornwall running and flying actively in the sunshine, and says that it was partial to viscid plants, such as *Erodium*, *Ononis*, etc. Parfitt says that in Devonshire it is found always near the sea, and this, too, is my experience in Carmarthenshire. On the Continent, however, it is met with commonly in inland situations, as, e.g. Switzerland ; it is also found on various plants in gardens, and in open country on thistles, *Hyoscyamus*, *Artemisia*, *Verbascum*, *Lamium*, and *Nicotiana*. De Geer says that it sucks the juices of henbane (*Hyoscyamus*) from the leaves and stems, notwithstanding the poisonous nature of the plant, and adds that it has no bad smell, but, on the contrary, exhales a strong and agreeable odour of thyme. On the dying down of its usual food-plants towards the approach of winter, it removes to moss or evergreen trees for wintering, and has been found on pines in October, on juniper in March, and in moss beneath juniper in January. (Reuter, 19.) Guérin and Péneau speak of it as occurring in summer and autumn in meadows, and Snellen van Vollenhoven records its presence on flowers of *Tanacetum*.

Distribution. *T. hyoscyami* has a very wide distribution, occurring throughout the Palaearctic Region, including China, and it even passes into India ; but it is very local in Britain. It was formerly taken on the coast sands near Great Yarmouth, being found, though but rarely, on *Ononis*. Almost all the other records, however, are from the south and west, especially the Isle of Wight, Dorset, Devon, and Cornwall, and in S. Wales, Glamorgan, Carmarthen, and Pembroke. It is also recorded from Sussex, Merioneth, and Carnarvon, and is said to have been taken on the Cheshire coast many years ago (Cooke). There is also a doubtful Yorkshire record in a MS. list kept by the late Mr. Denison Roebuck. Luff (3) speaks of it as common in Alderney. There are no records from either Scotland or Ireland, though on the Continent it extends to 63° 30′ N.

54. **Corizus crassicornis** L. and var. **abutilon** Rossi. (=Stictopleurus id Osh. Cat.).

Lin., F.S. 952 (1761) ; D. & S., B.H. 131 (1865) ; Saund., H.H.B.I. 56 (1892).

Common as this insect is on the Continent, I have not been able to find any account of its early stages.

Life-cycle. Guérin and Péneau say that it occurs in spring and summer in Brittany; I have taken it in Switzerland in August, and there are definite records for all the months from May to October.

Habitat, etc. This is a rare insect with us, and has been taken by sweeping in dry places; I have found it on the Continent by sweeping amongst long grasses. Champion took the var. *abutilon* at Deal by sweeping mixed herbage, and Douglas at Bournemouth by sweeping *Psamma*. Dalla Torre found it on *Umbelliferae*. In Oshanin's Catalogue the var. *abutilon* is given as a distinct species.

Distribution. This most variable insect is distributed throughout the Palaearctic Region. It is also recorded from N. America. In Britain it is known from five counties only, which form a compact little district in the south, viz. Kent, Surrey, Sussex, Hants, and Dorset.

55. **Corizus maculatus** Fieb.

Fieb. Beitr., i, 349, 30 (1836); D. & S., B.H. 133 (1865); Saund., H.H.B.I. 57 (1892).

Ova. Unknown.

Larvae. Last instar; shape very similar to that of imago; head brownish, pronotum greenish-grey, reddish behind, with black setose tubercles, hind margin excavate; scutellum fumose with central pale line; wing-pads reddish-brown, with apical half piceous; abdomen greenish-grey with dark red tubercles, and carrying on each side a straight lateral spine to each segment; this spine is white beneath and black above; abdomen testaceous beneath, with red tubercles; legs spotted. The whole insect is covered with rather long hairs.

Life-cycle. I have reared this species from nymphs taken at Ewhurst, Surrey, in August, 1889, and in the New Forest, August, 1917. Both remained about ten days in captivity before making the final change, and during that time they apparently fasted without any evil effects, for they produced imagines perfect in every respect. The records for the imago are from June to October. July is evidently the chief month for the larvae.

Habitat, etc. It is taken by sweeping in damp places. E. Saunders records it from *Myrica gale*, and Morley from *Scutellaria*. I have found it in some numbers in the New Forest in August by searching at the roots of great tufts of luxuriant grass at Matley Bog. The species of grass, I am told, is *Poa nemoralis*. J. Sahlberg gives *Comarum palustre* as a food-plant.

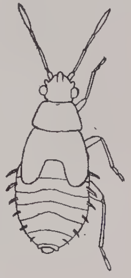
Distribution. This is a very local insect, though not nearly so rare as the preceding. It is recorded from Kent, Surrey, Sussex, Berks, Hants, and Dorset, as well as from Cheshire and Suffolk. Thus its chief habitat is the country south of the Thames, and the New Forest seems to be its headquarters. There are no records from Wales, Scotland, or Ireland. On the Continent it occurs mainly in Central Europe, from which it passes through Siberia to Japan.

56. **Corizus subrufus** Gmel.

Gmel. S.N. 2168 (1789); D. & S., B.H. 133 (1865) (capitatus); Saund., H.H.B.I. 58 (1892).

Ova. Unknown.

Larvae. J. Sahlberg (1) gives the following brief description of the nymph: "Fusca, flavo-variegata, nigro-setosa et inaequaliter tuberculata, antennis articulo ultimo excepto flavis, segmentis singulis abdominalibus lateribus spina bicolori armatis."



Nymph of *Corizus subrufus* Gmel.

This may be supplemented and amplified from some nymphs I found on the Chiltern Hills, Oxon: Fore parts castaneous, darkest at apex of wing-pads, a yellow line down middle of head and pronotum, abdomen ochreous with reddish spots; the whole upper surface carrying large black tubercles irregularly distributed and each emitting a long black seta; head shaped much as in adult, but with eyes not quite so prominent; no ocelli; pronotum short, very transverse, trapezoidal with rounded angles, and with a deep sulcation on each side a little behind the anterior margin; wing-pads reaching third abdominal segment; first six abdominal segments carrying at lateral margin a strong erect spine consisting of two parts side by side, one black, the other white, the white part thinner than the black; body widest in middle of abdomen; tibiae ochreous with castaneous rings; antennae four jointed, castaneous, apical joint stoutest, black, second lighter than the rest; tarsi with two equal joints; underside of abdomen ochreous with red markings, extreme margin yellow, sternum with ochreous markings near the coxae.

I have a much younger larva which I feel sure must belong to this species, though its appearance is at first sight very different. Length, 1¾ mm. Probably a first or second instar. Fore parts, antennae and legs dark castaneous, abdomen bright red; the whole upper surface carrying black setigerous tubercles, the setae being specially distinct on antennae and legs; five abdominal segments furnished with upright lateral spine, which is chiefly black, but carries a small white margin on its hinder side; underside chiefly red; abdomen very broad, widest in middle.

The nymph of this species much resembles that of the next, but is more brightly coloured, larger, and with longer hairs. The abdominal spines also are differently shaped, those of *C. parumpunctatus* being shorter, with the apex of the black part a little recurved, and having the white part considerably broader.

Life-cycle. The imago has been found here from June to September, and on the Continent from April to November. I kept a pair for several weeks in August and September, in the hope of inducing them to pair, and if possible to secure some eggs, but my attempt was unsuccessful. In the summer of 1918, when this insect was abundant in Oxfordshire, almost all were adult by the beginning of August, three larvae only being met with and in their last instar; the larval period would, therefore, be chiefly June and July.

Habitat, etc. It is specially associated with *Hypericum perforatum*, from which it may be obtained by sweeping. It is occasionally abundant, as at Gomshall in August, 1899, and on the Chiltern Hills, Oxon, in August, 1918. It is an active insect and readily takes wing. On the Continent it has been found on *Asclepias vincetoxicum* (Schilling) and also in pastures and damp meadows (Guérin and Péneau).

Distribution. This insect is generally distributed on the Continent and in Asia Minor and Siberia, and is common in many places. It extends also into the Ethiopic, Oriental, and Neo-tropical Regions. In Britain it is recorded from the coast counties from Suffolk to Devon, except Essex, and also from Surrey, Berks, Oxon, Glo'ster, and S. Wales (Glamorgan). There are no records from the north of England, nor from Scotland or Ireland. Its habitat, therefore, is almost entirely south of the Thames.

57. **Corizus parumpunctatus** Schill.

Schill. Beitr. 53, 4 (1829); D. & S., B.H. 135 (1865); Saund., H.H.B.I. 58 (1892).

57a. **Corizus rufus** Schill.

Schill. Beitr., 52, 3 (1829).

Here must be placed what on the Continent are regarded as two species, both of which we certainly have, though I am not yet prepared to say what is their distribution. Apparently, however, *C. parumpunctatus* is much the commoner of the two. The chief differences between the two are said to be as follows:—

C. parumpunctatus.	*C. rufus.*
1. Colour, reddish-grey.	1. Colour, red.
2. A black spot on throat under rostrum.	2. No such black spot.
3. A small black spot on the connexivum of each segment of ♂.	3. No connexival spots in either sex.
4. Genital styles stout and blunt.	4. Genital styles more slender and awl-shaped.

The last of these seems to be the most reliable character. The colour varies a good deal, and the amount of black in the connexivum is a very varying quantity in *C. parumpunctatus*, even its ♀ sometimes having a fair amount, while its ♂ has as much as *C. subrufus*. The black spot on the throat is said to be often absent even in true *C. parumpunctatus*.

What follows in this article must be taken as referring in the main to *C. parumpunctatus.*

Ova. Unknown.

Larvae. I found a nymph in a sandy field close by the ruins of Newark Abbey, near Ripley, Surrey. It was barely 5 mm. long, which seems rather small, if it were really the final larval instar. The following is a description of it: Whole body dark brown, covered with tubercles carrying short hairs; head triangular, with eyes prominent; pronotum trapezoidal, widest behind; abdomen oval, three segments with a strong, but short, spine at the side, each composed of two parts, one black and the other, which is much thinner, white; wing-pads long, basal part exteriorly pale, apical very dark brown; legs rather short, tibiae stouter than in the adult; antennae four jointed, with the two intermediate joints paler than the rest, and stouter than in the adult; no ocelli. (This, I believe, belongs to *C. rufus.*)

Life-cycle. The above nymph was found in August, but it was the only example then left amongst a number of imagines, so that, as with the preceding, the larval period is clearly June and July. The imago is found in August and September.

Habitat, etc. *C. parumpunctatus* is usually found either by sweeping in dry places, or by searching amongst *Erodium* and other plants on sandhills on the coast. Like *C. subrufus* it is occasionally abundant, as once by the roadside at Bournemouth (Saunders, 5). I have also found it commonly on the sandhills of Carmarthenshire, especially the Towyn Burrows at Kidwelly, where it occurred chiefly under *Erodium* (Butler, 32). Douglas took it by sweeping *Pimpinella saxifraga* on the Deal sandhills and *Psamma* at Bournemouth. It has also been taken on *Spiraea* flowers in Tuddenham Fen, Suffolk (Morley, 4). Other records are, at the roots of *Echium vulgare* (Morley, 4), at the roots of grass and under the leaves of herbaceous plants in sandy places inland. Guérin and Péneau give pastures and damp meadows as the habitat. It readily takes wing, especially in hot weather. Its ochreous colour makes it, of course, difficult to detect on the sandhills. The examples from Carmarthenshire are of a duller, browner or greyer tint than usual, and the connexivum is more or less spotted; but there do not seem to be any structural characters sufficiently marked and constant to separate it specifically from typical *C. parumpunctatus.* Through the kindness of Mr. H. J. Thouless, I have been able to examine several examples of a similar form from the "Breck" district, Norfolk. It is curious that the continental literature makes no reference to these forms with the largely spotted connexivum.

There is a beautiful var. of *C. rufus*, viz. *lepidus* Fieb., which is rather smaller than the type form, and has a beautiful rose-coloured sentellum and a greenish underside; I have taken it on sandhills in Jersey, but have not yet seen any British specimens. The ♂ genital segment of these insects is easily dissected out entire, and this is often necessary if the styles are to be accurately seen, as the entire segment is often withdrawn into the abdomen when the insect dies.

Distribution. *C. parumpunctatus* is found almost throughout Europe and it extends into Asia and N. Africa. It is the most widely distributed of the genus we possess in Britain. *C. rufus* has not quite so wide an area. The localities that follow probably refer mainly to *C. parumpunctatus*, but I have one specimen of *C. rufus* which was taken at Fleet, Hants. The records are from the coast counties from Norfolk to Dorset, except Essex, and from Surrey, Leicester, Oxon, and Bucks. The Welsh records are from the counties of Carmarthen and Glamorgan. There are no records from either Scotland or Ireland, though on the Continent it extends as far north as 63° 20′.

58. **Corizus hyalinus** Fabr. (=Liorhyssus id. Osh. Cat.).

Fab., S.R. 201 (1794); E.M.M. xxxix, 294.

"Specifically it can be at once distinguished from the other members of the genus by the long, very hyaline, membrane, the long apical joint of the antennae, which is much longer than the third, by the form of the abdomen, which is slightly widened and rounded posteriorly, whereas in our other species it is more or less acuminate, and by the coloration of the back, which, as in the other species, can be seen through the transparent membrane. The pattern of this is pale on a black ground, and the apical segment has a central pale parallel-sided line running up from the apex, with a black vitta on each side of it, whereas in the other species the central portion is black, and a pale line runs up on each side from the apex, bordering it. The connexivum in Mr. Beaumont's specimen is marked with large black spots, and the two black vittae on the terminal segment look as if they were connecting links to complete the continuity of the series" (E. Saunders, 49).

To this may be added that the collar to the pronotum is smooth and unpunctured, whereas in our other species it is punctured.

Of the early stages of this insect nothing seems to be recorded.

Life-cycle. There are records of the capture of the imago, either on the Continent or in this country, in the months from April to July and in October.

Habitat, etc. Guérin and Péneau say that it occurs in Brittany on moors and dry hillsides. On the other hand, one of our British specimens was found in a marshy spot.

Distribution. Only two specimens of this insect have hitherto been found in Britain, one by Mr. Beaumont in a marshy spot near Gosfield, Essex (Saunders, 49), and the other by Mr. Thouless (4) at Norwich, where it was sunning itself on the cemetery wall. Both these captures were made in the year 1903. On the Continent this is mainly a southern species, belonging chiefly to the countries round the Mediterranean ; but it occurs also in most of the other great zoological provinces, being recorded from S. Africa, Australia, and North and Central America. It would be interesting to know what is the cause of the wide spreading of this insect over the world. Can the very enlarged membrane have anything to do with it ?

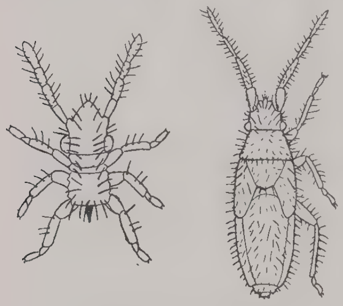
59. **Myrmus miriformis** Fall.

Fall. Mon. Cim. 60, 8 (1807) ; D. & S., B.H. 137 (1865) ; Saund., H.H.B.I. 59 (1892).

Ova. The egg is a most curious and interesting object. It is about 1·2 mm. long, and 0·3 mm. wide, almost white when first laid, but becoming ultimately of a shining brown colour, and either oval or subfusiform in outline, according to the aspect in which it is viewed. On that side which is outermost as the egg is attached to its support, there is a slight indentation opposite the point of attachment, and on each side of that a longitudinal furrow for about half the length of the egg. (These furrows may possibly be due to shrinkage on the drying up of the contents of the egg.) But the most remarkable feature is a pair of processes at the cephalic end, each shaped, in a side view, very much like a " note of interrogation." These are micropylar processes, though why they should be of such extraordinary form it is impossible to say. When the egg hatches, an operculum is separated from this end, leaving a perfectly even edge, and showing an aperture which, by reason of the furrows above-mentioned, has a somewhat pear-shaped outline. The suture of the operculum passes between the two micropylar processes, so that one of them is on the operculum itself, looking like a handle to a lid, and the other on the main shell. The surface of the operculum is roughened by a number of flat rounded papillae, which are placed more or less regularly in rows following the outline, and arranged concentrically round the micropyle. As this latter is excentric in position, the papillae become smaller and more closely packed, and, in fact, almost obliterated in its immediate neighbourhood. The operculum separates from the body of the egg completely, and after the issue of the larva, a delicate iridescent conical pellicle is left protruding from the shell (Butler, 29).

Larvae. The newly hatched larva is $\frac{3}{4}$ mm. long. As usual in the *Coreidae* the antennae are inordinately long and stout. The whole body is covered with long, stout, black setae, intermingled with fine white hairs, both sets of which are truncately clavate at the apex. The legs and antennae carry long black hairs tapering to a point, and each hair springs from a tubercle. Head very large, pale yellowish, becoming green in front, and with bright red eyes ; thorax green and abdomen pink ; legs whitish and barred with black; antennae fuscous at apex; rostrum longer than body, and with a stout black tip.

I took a larva in an intermediate instar in Epping Forest, June 15th, 1912, and the following is a description of it. Length 3½ mm. Green, with black and white hairs, the black ones from tubercles, which, at sides of abdomen become conical papillae; legs and antennae clothed with long hairs, similar to those of the first instar, except that they are only very slightly clavate at the end; hairs on outer side of tibiae black, very stout and long; those on inner side very fine and white; first joint of tarsi with a similar arrangement, but second joint glabrous; underside with white hairs; legs pale red; order of length of antennal joints, 1, 3, 2, 4; shape of body rather obovate, the greatest breadth being in middle of abdomen; a red spot on middle of dorsal surface of abdomen. In this instar the wing-pads have just begun to appear. It is therefore probably the third.


Newly-hatched larva. Last instar.
Myrmus miriformis Fall.

A nymph which I took at Burnham Beeches, June 22nd, 1912, was as follows: Length 6 mm. Body long oval, widest in middle of abdomen; green, with genital segment pink, and red antennae; legs reddish, clothed with both black and white hairs; an orange spot in middle of abdomen; wing-pads yellowish, extending only slightly beyond thoracic segments.

A smaller larva measuring 5 mm. had a narrower body, and was of an ochreous colour, above and below, with red spots; legs pale, with red spots; wing-pads margined with white, sterna with brownish lateral stripe; hairs chiefly white. The narrower shape and ochreous colour of this specimen suggest that it might have produced a ♂ imago.

In the full-grown larva the scent-glands, placed as usual on the dorsal surface, have circular openings lying on a red area which interrupts the black line running down the middle of the dorsal surface; this line diverges on each side when reaching the red area and is continued round its outer edge.

Life-cycle. On September 19th, 1910, I swept a ♀ amongst *Calluna* at Gomshall, Surrey. Hoping to obtain eggs, I brought it home and enclosed it in a tube with a twig of *Calluna* blossom. During the next fortnight about a dozen eggs were laid on the plant; they were placed either singly or two side by side, some on the leaves and some on the flowers. They were not in any way inserted into the tissues of the plant, but merely attached on the side by a gummy secretion at a small area on the middle of the long axis. They remained in this condition throughout the winter, and it was not till the end of the following May that they hatched. Unfortunately just at that time I was unable to examine them daily, and in the interval between inspections they hatched out, and the young larvae, finding no food, died (Butler, 29). Some other eggs, which were laid in July, and which were sent me by Mr. H. A. Saunders, failed to hatch at all. I have frequently found the sexes united in August, and the fertilised ♀♀ quickly become gravid. Thus the life-cycle would seem to be as follows: copulation and oviposition, July to September; duration of egg stage from these months through the winter to the following May; larval period June and July; imagines appearing in July and August. If this is correct, then the imagines must die off in autumn, and with this agree most of the British records, which are for the months from June to October.

Habitat, etc. This insect is generally associated with heathy places, on which it is usually common, and it may be obtained by sweeping the grasses which grow in such spots. I have often taken them by evening sweeping, so that they evidently remain on the upper parts of the vegetation at least till sunset. J. E. Mason records the species from rushes, September 13th, 1897, at Burnt Wood, Lincs. Mulsant and Rey speak of it as occurring amongst *Centaurea* and *Senecio*, and J. Sahlberg on species of *Calamagrostis*.

In this insect we meet for the first time the phenomenon of dimorphism, each sex existing in two forms, though the undeveloped, or brachypterous, form of each is the commoner. In August, 1892, however, the developed forms were much commoner than usual on the hills near Shere, Surrey. Apparently hemielytra and wings suitable for flight do not give any sexual advantage, for macropterous ♂♂ were found mated with brachypterous ♀♀ and vice versa, as well as both macropterous and both brachypterous. Hence, if sexual selection exists, it is independent of the development of the flying apparatus. Nothing can be said to be definitely known, either as to the causes or the use of this double existence. It is obvious that the macropterous examples would have, in their wings, superior powers of migration, and therefore might aid in the spread of the species. But, on the other hand, the mere presence of wings in an insect usually apterous, or nearly so, does not amount to proof positive that the wings are *used*. Many of the larger Hemiptera seem reluctant to use their wings, trusting more to their legs, or to the simulation of death, in order to escape danger. The suggestion has been made that the individuals possessing these superior powers, being presumably more vigorous than their brachypterous brethren, may fly away to mate with other broods and so secure the benefits of cross-fertilisation. It has been suggested also that great heat has some influence in perfecting the alary organs; but it is difficult to understand why, if this is so, all the examples that are exposed to similar climatic conditions do not become macropterous instead of only the small percentage of them that are usually affected. As the sexes are quite differently shaped the species occurs in four different forms. Since the abbreviated hemielytra are quite useless for flight it is difficult to see why they are retained with this particular degree of curtailment instead of being lost altogether. They may perhaps serve to give strength to what might otherwise be the weakest part of the body.

The larva which I took in Epping Forest, as mentioned above, died before I could determine whether it was vegetarian or carnivorous in diet. I had supplied it with *Calluna* and the fine grass which grows amongst it, and also with a larva of a *Miris* and a stout *Aphid*. The *Miris* larva died after a few hours, but whether killed by the *Myrmus* or not I could not tell. The larger specimen taken at Burnham Beeches was also supplied with both *Calluna* and the fine grass, as well as with a stout *Aphid*. I saw it sucking the grass, but apparently it did not attack the *Aphid*. Hutchinson also reports specimens as sucking grass.

Distribution. *M. miriformis* is distributed throughout Europe, and extends possibly into Siberia, but apparently does not occur on the southern side of the Mediterranean. Its place seems to be taken there by the allied genus *Agraphopus*. In Britain it has been recorded from all the coast counties from Yorks round to Glo'ster, and from Cumberland, Notts and Leicester, Oxon, Bucks and Herts, Hereford, Surrey and Berks. There are no records for either Wales, Scotland, or Ireland, a restriction hardly to be expected, since on the Continent it occurs as far north as Lapland. Six other species of the genus have been described from the Asiatic part of the Palaearctic Province.

60. **Chorosoma schillingi** Schml.

(Schml.) Schill. Beitr., 55, 7 (1829); D. & S., B.H. 139 (1865); Saund., H.H.B.I. 60 (1892).

Ova. These are much like those of *Myrmus*, differing chiefly in their slightly stouter build and in the shape of the micropylar appendages. The egg has been described by Capt. Xambeu in "Ann. Soc. Linn. Lyon," 1904, as follows: "Oeuf, long. 1 mm., diam. 0.3 mm. Très allongé, subfusiforme, gris terne, cerclé de blanchâtre au pôle supérieur, lequel est surmonté d'un pédoncle gris couronné d'un bouton en forme de chapeau de champignon à circuit blanc de lait; une tige semblable surmonte le pôle: de plus, au milieu de l'œuf, est une excroissance noire appuyée sur un circuit à fond plus clair. Œuf bizarre par ses protuberances excentriques, pondu en petit nombre."

From some eggs kindly sent me by Mr. Hugh A. Saunders I gather that the "gris terne" in the above description expresses the colour of the eggs when first laid. Later on they become darker and of a brown colour. The phrase "cerclé de blanchâtre" refers to the suture between the operculum and the body of the egg, which is much more distinct in this species than in *Myrmus*, and which, as in *Myrmus*, passes between the two appendages. The "chapeau de champignon" represents the front view of the appendages; in profile they are more like those of *Myrmus*, though not so distinctly suggestive of the question mark. It will be seen that, notwithstanding the wide difference in size between the imago of the two species, of which *Myrmus* measures 7 to 9 mm., and *Chorosoma* 15 to 16 mm., the dimensions of the eggs are almost identical, that of *Chorosoma* being merely slightly the stouter in build. The eggs are attached at the side to a thin stalk of *Psamma arenaria*, the plant on which the imago occurs, and in nature they would, therefore, be placed in a more or less vertical position, with the cephalic end uppermost (Butler, 29).

Leuckart gives the following additional particulars: The chorion is rather thick and of a brownish colour. It is composed of three superimposed layers of different structure, an upper, middle, and lower, but they adhere closely together and in many parts cannot be separated. The lowest and at the same time thinnest of these layers has a finely granulated structure. The middle layer gives the egg its brownish colour, and is composed of hexagonal depressed areas, separated from one another by rather broad furrows; this is covered by the homogeneous outer layer. Only on the surface does this outer layer display any peculiar structure; there are numerous large protuberances of semi-circular shape which leave between them deep depressions, and are so situated that each protuberance lies over one of the depressions of the middle layer. Where the depressions between these protuberances meet they sink here and there into a fine canal which leads into either the depressions or the furrows of the middle layer, and allows air to pass to the inner surface. For the attachment of the egg to its support there is on one side a disc composed entirely of the outermost and structureless layer of the chorion. There are two micropyles, both on the middle line of the egg, one on the lid and near its anterior margin, and the other above the lid at the anterior end of the egg. Each of the micropyles is situated in a small rounded or pear-shaped prominence which carries at its apex a trough-shaped depression, from the bottom of which leads the micropylar canal through the spongy mass of the prominence itself.

Larvae. From an egg sent me by Mr. H. A. Saunders in the autumn of 1911 a larva hatched on either the 27th or 28th of May, 1912. Owing to a short absence from home just at that time I did not discover it till the morning of the 28th, when it was almost exhausted from lack of food. This newly hatched larva had not the elongate form of the adult. The following is a description of it. Yellowish-grey with a broad reddish-brown band on each side, starting narrowly from the apex of the head and running throughout the length of the body; connexivum broad, yellow; eyes red; head very large, as broad as the body, bluntly produced between the eyes; antennae four-jointed, stout, and longer than body, reddish-brown, closely set with long thick hairs; last joint clavate and stouter than the rest; body clothed with long white hairs; on the terminal segments a few stout, black bristles; legs stout, greyish-yellow, with short hairs proceeding from tubercles, which are arranged more or less in rings ; rostrum clear yellowish with black tip, reaching beyond posterior coxae.

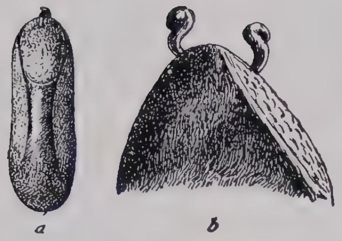
The fully grown larva is much like the imago, both in colour and shape. Morley (4) says of larvae which he found in July : " I was much amused at the peculiar aspect presented by the strongly recurved abdomen in walking." Amyot points out that the nymph has the first joint of the antennae proportionately shorter than in the adult and thickened at the apex ; the last joint is proportionately longer than in the adult and fusiform ; and the whole insect with a long and scattered pilosity.

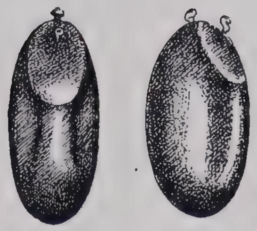
Life-cycle. As above stated, the larvae may be found in July, and the insect matures in August. Copulation takes place in August, and the ♀♀ rapidly become gravid. In copulation the insects are tail to tail, the smaller ♂ being dragged behind by his larger partner. The eggs mentioned above were laid in September, but did not hatch till the following May. Thus apparently the life-cycle is as follows : copulation in August ; oviposition in September, the egg state lasting through the winter till the end of May ; larvae found during June and July, and maturing in August. But on the Continent imagines have been found from March to November, except in April. These earlier examples of imagines would therefore appear to be over-wintered specimens.

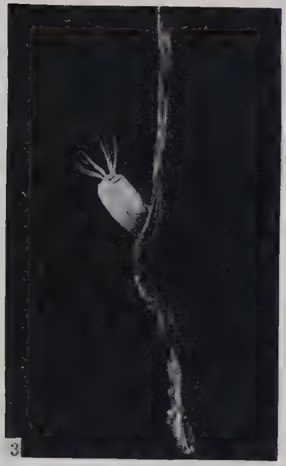
Habitat, etc. This extraordinary insect is almost confined to sandhills on the sea-coast, where it is found on the Marram grass (*Psamma arenaria*). I have, however, taken it in a marsh at Swalecliffe near Whitstable, and Hall (3) records it as common on " rushes " at Deal : in agreement with this, Amyot and Serville give " *joncs* " as the plant on which it occurs. Xambeu speaks of finding it on *Inula viscosa*, Schumacher on *Verbascum*, and Dalla Torre in moss.

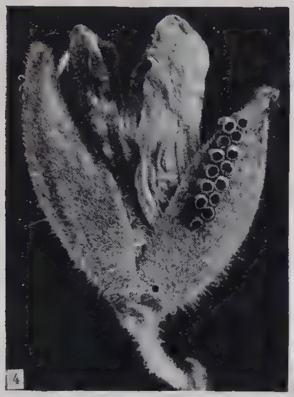
This species is an excellent example of correspondence with environment, but it is not easy to see that such correspondence is in any way protective. The insect is usually one of the largest, if not *the* largest, to be found on the sandhills, and can scarcely need protection from other insects, so that birds would seem to be the only possible enemies, especially as no Hymenopterous parasites are known of this family of Heteroptera. The general shape and colour are certainly a very close imitation of the spikelets of the grass on which it spends its life, the peculiar bleached appearance corresponding very closely with the condition of the spikes of the grass at the time when the insect is mature. Is there not a possibility that both the insect and the grass owe their similarity to the action of some common cause which has affected them both in the same direction, without necessarily securing protection for either of the organisms concerned ?

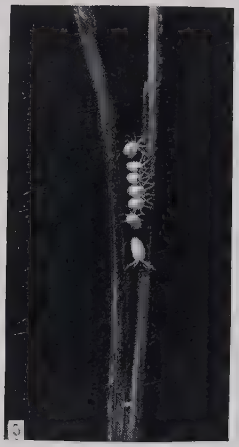
I have a specimen, *ex coll.* Capron, in which the right posterior leg is dwarfed to about half the usual size, while still preserving the proper proportion in its different parts.

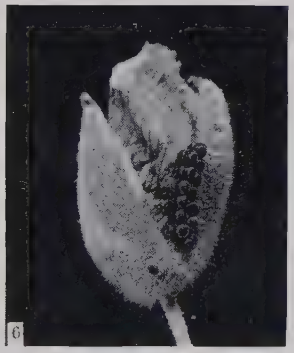












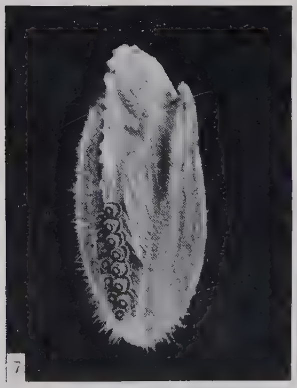


Plate III.

1. Egg of Myrmus miriformis, Fall. (*a*) Front view; (*b*) Cephalic end, more highly magnified. 2. Front and side views of egg of Chorosoma schillingi, Schum. 3. Egg of Nepa cinerea L. on decayed pond weed. 4. Eggs of Piezodorus lituratus F. on gorse flower, after escape of parasites. 5. Eggs of Nepa cinerea L. on rushes. 6. Eggs of Piezodorus lituratus F. on gorse flower. 7. Eggs of Piezodorus lituratus F. on gorse flower, after hatching.

H. Main, photo.

Distribution. This insect occurs throughout the greater part of Europe, and in Algeria and some parts of westernmost Asia. Its distribution is of course determined by that of the plant on which it is found, and in Britain, at any rate, it is confined to the coast counties. In these it is found in suitable spots from Norfolk round to Cornwall, with the single exception of Hants, for which I can find no record. It occurs also in S. Wales, in both Carmarthen and Pembroke. Like many other of the *Coreidae*, it seems to be somewhat irregular in its appearance, being much commoner in some seasons than in others; e.g. at Ferryside, near Carmarthen, in 1906 I could scarcely find a single specimen in August, whereas three years later, on exactly the same spot and at exactly the same time of year, I found them quite plentiful. It has not been found in either Scotland or Ireland. Three other Palaearctic species have been described, only one of which is European.

Family III. **BERYTIDAE.**

These "stilt-bugs" constitute a family of small extent, only thirty-three Palaearctic species having thus far been catalogued, and the exotic representatives at present known are not very numerous. That we should possess eight species of this restricted family is therefore an excellent record. They are mostly groundlings in habits, are rather sluggish, and have a peculiarly dainty kind of walk, conditioned, no doubt, by the great length and slenderness of the legs, and the extremely small size of the tarsi. The shape of the head easily distinguishes the two sub-families. According to Tullgren the auditory hairs in this family consist of a pair on each side of the centre of the second ventral segment of the abdomen. Only one member of this family has yet been discovered in Ireland, viz. *B. signoreti*. The larvae, so far as known, are green and in *Berytus* are furnished at first with globe-tipped hairs, which are lost in the later instars or in the adult. The ova, so far as known, are more or less cylindrical, tapering at the ends, of a shining honey-brown colour, and with a strongly sulcated surface. Hatching is accomplished by a longitudinal splitting of the anterior end.

Sub-family I. **Berytina.**

The prolongation of the head between the antennae easily separates this group from the Metacanthina. They live on the ground, at the roots of plants, for which their ochreous coloration is appropriate. They exhibit a peculiar kind of pterygo-dimorphism, different from that of *Myrmus*, and to it the name of crypto-dimorphism or stenoptery has been applied. Each species probably exists in two forms, and several of these were at one time described as distinct species, with a consequent multiplication of synonymy. One form has both hemielytra and wings fully developed, and the other has the wings more or less aborted, the hemielytra slightly reduced in breadth and the membrane considerably contracted laterally, so that it becomes more acuminate. At the same time the pronotum, which as usual overlaps the mesonotum, the site of the reduced muscles of flight, becomes narrower and flatter.

61. **Neides tipularius** L.

Lin., F.S. 258, 973 (1761) ; D. & S., B.H. 161 & 162 (1865) ; Saund., H.H.B.I. 61 (1892).

Ova. Unknown.

Larvae. The larva in all its instars is green, and is very similar to the adult in form. A specimen which I have in an intermediate stage measures 5½ mm., and it shows the merest trace of wing-pads in the form of minute triangular processes. The fore parts are furnished with a few scattered white setae. The femora and first joint of the four-jointed antennae are scarcely clavate. The tarsi as usual are two-jointed.

Last instar, 9½ mm. Very much like adult ; frontal process well developed, and with a single row of truncately clavate hairs along its upper edge ; similar hairs sparsely scattered on head, pronotum, and wing-pads, and smaller ones on the abdomen ; eyes red ; pronotum keeled at sides, and with a white longitudinal central line ; wing-pads long and narrow, reaching a little more than a third of the distance down the abdomen ; first antennal joint scarcely clavate at apex, apical joint black ; femora only slightly clavate, the thickest part darker, apex of tibiae and whole of tarsi black ; apex of rostrum black ; legs and antennae a little less thin than in adult. At the last moult the whole system of erect scattered clavate hairs is exchanged for the adpressed closely set pubescence that appears in the adult.

Life-cycle. The imago has been found from March to October, and the larvae in July and the beginning of August. This seems to imply the overwintering of the imago. Snellen van Vollenhoven found specimens *in cop.* in August.

Habitat, etc. This insect is by no means common with us, and is usually met with casually by sweeping or searching in grassy places. But I have found it in considerable numbers on the sandhills at Pendine, Carmarthenshire. Here it occurs amongst the *Ononis* which grows abundantly on the Burrows. Two nymphs which I brought from this locality in August became imagines in three and four days respectively. When kept under a glass shade they were seen to spend some time in cleaning the terminal joint of the antennae, by drawing it between the anterior tarsi. This joint, from its stouter build, and its close-set hairs, is no doubt the most sensitive part of the antenna, hence the necessity for keeping it clean, especially amongst the viscous *Ononis*. The insects are considerably more speedy in their movements than might have been expected, more so, in fact, than the genus *Berytus*, and in walking, the body is kept well up off the ground. The walk, which never amounts to a run, is of a peculiar jerky kind (Butler, 32).

Douglas found this insect in some numbers at Deal, amongst dried grass-bents, which of course the bugs closely resembled, so much so indeed that, had they but remained motionless, they would easily have escaped notice. Prof. Westwood (1) found the species in all its stages in the Isle of Wight in profusion on a small plant of *Ononis*, and he remarks that the specimens seen did not make any use of their wings. It has also occurred under *Erodium*. On the Continent, it has been found, probably over-wintering, under juniper as well as on pine trees and by beating faggots (Reuter, 19). Mulsant and Rey say that it is sometimes seen on flowers, or even in houses, into which it is probably introduced with vegetables. Amyot and Serville again say that it occurs in damp places, climbing slowly about even over tall plants. Puton (3) mentions *Verbascum*, *Hyoscyamus*, and *Erodium* as plants on which it may be met with. Prof. Carr reports discovering a specimen in moss in September.

Distribution. This species is distributed throughout Europe, and occurs also in Asia Minor and Turkestan ; in Britain also it is widely spread, having been recorded from all the coast counties from Norfolk to Devon, except Sussex, and also from Cumberland, Lancs, Notts, Oxon, Bucks, and Surrey, and from S. Wales (Carmarthen and Pembroke). But there are no records from either Scotland or Ireland.

62. **Berytus clavipes** Fab.

Fab., E.S. iv. 192, 20 (1794) ; D. & S., B.H. 154 (1865) ; Saund., H.H.B.I. 64 (1892).

Ova. When first laid the eggs are pale yellowish, but later they become honey-yellow, and finally almost brown. The surface is shining. The egg is of a long cylindrical shape, slightly tapering posteriorly, and furnished anteriorly with a circle of half a dozen minute button-shaped prominences, each with a depression in the centre, and no doubt micropylar in function. When the egg is attached to its support the whole of the visible surface is found to be longitudinally deeply sulcate ; the furrows are few in number and the ridges between them are convex. The furrows and ridges are continued up to the circle of prominences, but not beyond them. The egg is barely $1\frac{1}{4}$ mm. in length.

I had a batch of something over two dozen such eggs attached to grass leaves by a little adhesive secretion at the middle of one side, and I had expected that, in hatching, the integument of the small area within the circle of micropylar points would be pushed off as a cap, as this method occurs very frequently amongst the Hemiptera. But such did not turn out to be the case. The chorion merely split longitudinally at the anterior end, and the embryo pushed its way out through the opening, but without casting off any part of the shell (Butler, 35).

Larvae. The larvae in their first instar differ markedly in several respects from the adult, and are furnished with certain provisional structures which entirely disappear at the first ecdysis. The newly-hatched bug has a small, narrow, cylindrical body, and very long legs and antennae; fore parts almost colourless except for a dark greyish streak on each side; abdomen pale green with black tubercles on the dorsal surface, from each of which proceeds a long, colourless, stoutish hair, ending in a brilliant crystal globule; the black spots arranged so that there are four on each segment, the two anterior ones being closer together than the posterior, so forming a regular pattern down the body; rest of dorsal surface furnished with similar hairs, which do not, however, proceed from black tubercles; eyes bright red and with but a few large facets; legs and antennae almost colourless with a slightly dusky skin, and covered with hairs similar to those on the body; club of antennae and claws black; rostrum four-jointed, colourless, and with a black tip; ventral surface destitute of the hairs which give such a striking appearance to the rest of the body; area between the antennae at first almost flat, and there is very little indication of the frontal process which is so marked a feature in the adult, in which it is longer and more pointed than in any other British species, but it becomes clearly visible before the end of this instar; length of body at disclosure hardly 1 mm., but the insect grows rapidly till it reaches a length of 2½ mm. before the first ecdysis takes place. The movements and attitudes of the young insect are similar to those of the adult, the body being raised considerably and balanced on the legs as on springs. The above-mentioned apparatus of globe-tipped hairs and black tubercles is discarded at the first change of skin, and the insect remains henceforward destitute of them. Whatever may be their function, it is confined to the first week of the insect's life.

In the second instar the larva was over 3 mm. long, or more than three times its original length, which seems an extraordinary amount of growth with only a single moult. It is now very pale green, with a central white line running from one end of the body to the other, and with the lateral margins broadly whitish; this colour becomes distinctly white in the three thoracic segments. As already mentioned, the black spots and hairs have disappeared, only a few small hairs being left at the extremity of the abdomen. A thin dark line proceeds on each side from the red eye to the end of the thoracic segments, just inside the white border; underside white, and legs pale testaceous with a black ring before the end of each femur; antennae with second joint dark at the base and apex and last joint black; frontal process much more distinct.

In the third instar no change takes place in the appearance of the larva, except that the frontal prominence becomes still more marked. The colours also are more distinct; there is a white central line, dark green lines bordering this on each side, and yellowish-green lateral border. In this instar the insect was 4½ mm. long.

In the fourth instar an important alteration in the appearance is seen;

the wing-pads appear, and the pronotum is strongly margined and carinated in the middle, so that it assumes something of the shape which is characteristic of the adult Berytina; wing-pads short, covering only two abdominal segments, and frontal process strong, but still blunt; the white central line marked with a greenish spot at the passage from each segment to the next. During this instar the insect reached the length of 5 mm.

In the fifth instar it was 5½ mm. long and more ochreous in colour; wing-pads longer, lanceolate, and covering nearly three abdominal segments; central keel of pronotum continued right through the scutellum, and forwards along the head into the frontal process, which is now entirely white; the white colour continued round it in front on to the underside, as a distinct margin, and enclosed area brownish-green (Butler, 35).

Life-cycle. On May 25th, 1912, I found three ♂♂ and four ♀♀ at the roots of grass on a wayside bank at Royston, Herts. The ♀♀ were very gravid, and as this species is usually regarded as one of the rarest of our British *Berytidae*, I was anxious to secure some eggs. I accordingly enclosed the ♀♀ in a box with some grass stems and leaves, and added one ♂. This immediately paired with the smallest of the ♀♀, and they remained coupled for three days. On May 28th the first eggs were laid, and others followed at intervals during the first week in June. These were the eggs described above. The first eggs hatched on June 19th, thus giving a period of three weeks for the duration of the egg condition. On June 27th I noticed the first cast skin, and this gives some seven or eight days for the first instar. The second ecdysis was observed on July 6th, leaving an interval of about nine days for the second instar. The third ecdysis took place on July 12th, so that the third instar lasted about six days. The fourth took place, to my surprise, on July 15th, only three days after the preceding one. The young bug was now in its fifth, and probably last, larval instar, and I had every hope of rearing it to maturity. But for some reason or other I failed to do this, and it died on July 25th, having been ten days in its last instar. Two others reached the same stage, and then, after a still longer delay in this instar, unfortunately succumbed, one on September 3rd, and the other on September 7th. These last two had entered their last stadium on August 1st and August 10th respectively. As I was spending August in Snowdonia, I had to take these two with me, and possibly the abnormally cold and cheerless weather we had during that month, accompanied as it was by incessant rain, may have proved too much for their constitution, and their little lives came to an end after they had lived with me between nine and ten weeks. Thus pairing towards the end of May, followed by oviposition soon afterwards should have yielded imagines in August. There are records also of the capture of imagines in June, July, September, and October. These latest apparently should pass the winter in retirement, to reappear and found a new generation in the following spring (Butler, 35).

Habitat, etc. The Royston examples referred to above were, as already stated, found at the roots of grass, but although this was the case, there were, of course, several other plants mingled with this, and I could not be sure that the grass was really their food-plant. I was, therefore, pleased to see that some of them, rejecting the other plants enclosed with them, occasionally applied the tip of the rostrum to the grass leaves and apparently fed upon their juices. When the young generation were hatched, I kept them well supplied throughout their life with ordinary lawn grass, mainly, no doubt, *Poa annua*, and they often liked to get down to the dry and brown parts of it near the roots, where they would remain for a long time immovable. They were frequently seen to plunge the rostrum into the green parts of the grass, and sometimes they kept it inserted for hours at a stretch. As the rostrum is comparatively short and the legs inordinately long, the attitude in feeding is peculiar; the body is tipped forward with the front legs rather straddling and the hind ones placed nearly parallel to one another, supporting the upturned abdomen. In rest, the attitude is very graceful; the body is neatly balanced on the symmetrically disposed legs, and the antennae carried with the first two joints directed upwards and backwards, and the others then bent forward upon them, so that the black club, which is unquestionably the most sensitive part, is farthest forward; its position is sometimes just over the head, or again, when the insect is apparently more alert, somewhat in advance of it. These insects seemed quite satisfied with their grass diet at first, but it is possible that a change of diet in their last instar, or possibly even the substitution of an animal for a vegetable one, might have enabled them to complete their metamorphosis. In feeding the labial trough is bent at an angle between the second and third joints, while the terminal one guides the setae (Butler, 35).

This insect has been found also on bare sloping ground at Mickleham, in moss at the roots of *Teucrium scorodonia*, and in tufts of grass at Bexley Wood in October. On the Continent it has also been found on juniper in October, whither it had no doubt retired for the purpose of wintering (Reuter, 19). Schilling says it is found in sandy places.

All our English specimens are, I believe, of the brachypterous, or rather stenopterous type, and, in fact, the macropterous form appears to be very rare, even on the Continent.

Since my experience with the Royston specimens, I have found the eggs of this insect attached to the leaves of *Ononis* plants, and Mr. H. Britten also has reared the insect through its last instar by feeding it on *Ononis*. This plant must, therefore, be regarded as yielding its principal food.

Distribution. Though pretty generally distributed in the Palaearctic Region, *B. clavipes* is, as a rule, rather rare, or, at least, very local, in

Britain; but where found it is often plentiful. It has been recorded only from Norfolk, Suffolk, Herts, Glo'ster, Oxon, Bucks, Kent, Surrey, Berks, the Isle of Wight, and Pembrokeshire, together with a doubtful record from Yorks. I have found it abundant in certain places in Herts and Bucks. It does not wander; and there is a small spot on a certain roadside bank near Royston, where I found it regularly for nine successive years, in fact, all the times I visited it.

63. **Berytus minor** H.S.

H.S. Nom. Ent., i, 43 (1835); D. & S., B.H. 157, 158 & 153 (1865); Saund., H.H.B.I. 63 (1892).

Ova. I have no information about these, but they may be expected to be similar to those of *B. clavipes*.

Larvae. The young larva is bright green, as with *Neides*, and is similar to the imago in form. In the last instar, 5¼ mm., it is very similar to that of *B. clavipes*, differing in having the frontal process shorter and less acute, the wing-pads and antennae rather shorter, the terminal joint of the latter being rather stouter and less elongate; the apex of the first joint is also dark, and the anterior angles of the pronotum less sharply defined.

Life-cycle. Apparently the eggs of the same brood do not necessarily synchronise in hatching, as I have found insects of all ages together in August. Douglas and Scott (1) speak of the imago as found in spring, autumn, and winter, so that it evidently hibernates, the insects of the year maturing in August. I have taken it in April at Ewhurst, Surrey, in May in Epping Forest, and in June at Royston, Herts. Bedwell records it in September from Barnby Broad (Morley, 4). I have found the sexes *in cop.* in August, and the fertilised ♀♀ rapidly become gravid. There are definite records of its capture from April to October, and in February.

Habitat, etc. This insect is the commonest of the genus with us. It is usually found in dry places, in moss, or at the roots of grass, especially in sandy localities, and it is essentially a ground insect. In August, 1892, I found a large colony at Farley Heath, Surrey. They were on the ground, amongst scattered, very stunted herbage, such as *Polygonum aviculare*, etc., and were of all sizes, from those which had evidently only recently hatched, to the mature imago. Many of the ♀♀ had the abdomen enormously distended both laterally and vertically; this, added to the crypto-dimorphism, leads to a considerable diversity of appearance within the limits of a single species. Several curious habitats have been recorded; Morley (4) gives it as found by Tuck in a nest of *Bombus muscorum*, by Bedwell in marsh hay, and by himself on water-weeds at Oulton Broad, and in a brackish ditch at Bawdsey.

It is much slower in its movements than *Neides*, and must, indeed, be characterised as sluggish and inactive.

The stenopterous form (*B. commutatus* D. & S.) is much the commoner of the two. The macropterous has been known under the names *B. vittatus* Fieb. and *B. cognatus* Fieb., and is recorded from thyme and moss (Douglas and Scott, 1).

Distribution. It is distributed throughout Europe, reaching its northernmost at 65°, and extends into Siberia and Algeria. In Britain it occurs very generally, though seldom in such numbers as in the case mentioned above. It is recorded from all the coast counties from Norfolk round to Glo'ster, as well as from Cumberland, Lancs, Cheshire, Warwick, Worcester, Oxon, Bucks, Berks, Cambs, Herts, Middlesex, and Surrey, and it extends into Scotland. The only Welsh record is from Glamorgan. It is also recorded from the Isle of Man (Douglas and Scott), but not from Ireland.

64. **Berytus signoreti** Fieb.

Fieb., W.E.M. iii, 204, 1 (1859); D. & S., B.H. 150 (1865); Saund., H.H.B.I. 64 (1892).

Ova. I found several gravid ♀♀ on June 1st, 1915, at Royston, Herts, under *Ononis*. In captivity these laid a few eggs on a *Trifolium* which was growing with the *Ononis*. The eggs are almost exactly like those of *B. clavipes*, already described; they are of the same brownish colour, with the same deep sulcations and micropylar points; they are, however, a little shorter, though of about the same diameter. Considering the difference in the size of the imagines of these two species, it is remarkable that there is so little difference in the ova (Butler, 37).

Larvae. These ova hatched at intervals during the third and fourth weeks of June, and by preference took to the *Ononis*. The newly hatched larva also is like that of *B. clavipes*, save that it is shorter in body, and has scarcely any green coloration; it is, in fact, almost colourless except for a smokiness of legs and antennae; the abdomen has many black dots upon it, and from these spring the globe-tipped hairs, which occur also on legs and antennae (Butler, 37).

2nd instar, $1\frac{3}{4}$ mm. Very similar to the 1st instar, with the same globe-tipped hairs; colour greenish with a smoky tinge; thoracic segments with callose white margins.

3rd instar (?), $2\frac{1}{2}$ mm., green; rudiments of wing-pads present; globe-tipped hairs still present, and especially prominent on the thoracic segments. This is rather a puzzling form, as one would have expected the globe-tipped hairs to have disappeared. Further, I have a larva in what appears to be the third instar, which is 3 mm. long, and on which there are no globe-tipped hairs, nor any trace of wing-pads.

Life-cycle. Douglas and Scott (1) report the imago at West Wickham in March, at Sanderstead in May, at Mickleham in April and August, and at Deal in May and August. I have taken it at Royston as above in June, and at Hastings in September, and Bedwell has taken it in October;

Snellen van Vollenhoven reports it from Holland in July. It may be found in the open, therefore, from March to October, and the spring specimens are evidently over-wintered ones. Thus, the eggs are laid about the beginning of June, the larvae hatch towards the end of that month and mature in August, these newly-formed imagines passing through the winter and depositing their eggs in the following summer, while the over-wintered examples appear to survive almost up to the time for the production of the new generation.

Habitat, etc. The habits are similar to those of the preceding species. It is almost as common as *B. minor*, and, like it, occasionally occurs gregariously. Thus I once met with a considerable number of specimens at the roots of herbage on a small section of a wayside bank near Ewhurst, Surrey. I have taken it commonly by sweeping on a flowery hillside in Oxon. It is recorded also from sandhills in Lincolnshire (Mason, 1) and from moss (Douglas and Scott, 1). Morley (4) records it from roots of *Erica tetralix*, and *Senecio jacobaea*. Puton (3) says that in France, the brachypterous (i.e. stenopterous) form is the commoner, and, I believe, such is also the experience of English hemipterists.

Distribution. This insect is not so widely spread as the preceding; according to Oshanin it occurs chiefly in Europe, Asia Minor, and Turkestan.

In Britain also the records are rather fewer than for *B. minor*. It is recorded from the coast counties from Northumberland to Glo'ster, except Durham and Essex; also from Cumberland, Oxon, Herts, Surrey, and Berks, from Glamorgan and Carmarthen in Wales, from several parts of Scotland, and also from Ireland.

65. **Berytus montivagus** Mey.

Mey., S.F.Z. ii, 88 (1841); D. & S., B.H. 151 (1865); Saund., H.H.B.I. 64 (1892).

Ova. Undescribed.

Larvae. Larvae in third and fourth instars, which, I believe, belong to this species, are green and almost undistinguishable from those of *B. minor*, but with legs and antennae proportionately rather longer, and terminal joint of antennae narrower; there is also a black streak at the side of the head in the line of the eye, both before and after it; apex of second and third joints of antennae slightly darkened; frontal process contracted just before apex; in the third instar there is no sign of wing-pads, and in the fourth these are present as short and acutely pointed processes.

Life-cycle. Douglas and Scott (1) record the imago from Sanderstead in March, from Folkestone in September, and from the coast of N. Devon in October; I have taken it at Maidenhead, Shalford, Gomshall, and Chesham in August. Bedwell has taken it in April, July, and November, and Morley (4) in June. It is evident, therefore, that this also is an over-wintering species, the spring specimens having been hatched the previous year. I can find no records for May.

Habitat, etc. This species is certainly less common than the preceding, but it is met with in similar localities, such as moss and the roots of grass ; it has also been found under broom bushes (Douglas and Scott, 1), and by sweeping amongst grasses. Reuter (19) reports it on juniper in October, probably the commencement of hibernation. Our British specimens appear to be all macropterous ; Puton (3) has the following remarks : "Cette espèce est ordinairement macroptère, bien que le pronotum soit moins relevé que chez les macroptères du *minor ;* cependant les exemplaires conservés dans les collections sous le nom de *geniculatus* (Fieb. inéd.), qui sont un peu plus petits et ont la membrane plus étroite et le pronotum plus déprimé peuvent être regardés comme des exemplaires subbrachyptères dont je n'ai vu que des mâles." The var. *rotundatus* Flor, which occurs in the south of France and Hungary, has the membrane without black bands, and the femoral clubs and the first antennal joint concolorous.

Distribution. It is distributed over the greater part of Europe and in Asia Minor, Turkestan, and the Canaries ; in Britain it is recorded from the coast counties from Norfolk to Cornwall, except Essex, as well as from Cumberland, Notts, Glo'ster, Somerset, Oxon, Bucks, Berks, and Surrey, and from Pembrokeshire. But there are no records for Scotland or Ireland.

66. **Berytus crassipes** H.S.

H.S. Nom. Ent. i, 43 (1835) ; D. & S., B.H. 156 (1865) ; Saund., H.H.B.I. 63 (1892).

I have no information about the earlier stages.

Life-cycle. This is probably similar to that of the other species of the genus, as the imago has been found from March to October with the exception of May ; J. Sahlberg reports a larva in August.

Habitat, etc. *B. crassipes* is of only occasional occurrence, and is usually met with singly. I have found it on *Erica*, and it has been recorded from such habitats as reeds, a marsh haystack (Morley, 4), under juniper (Reuter, 19), and in an ordinary hedge (Chitty, 4). Douglas and Scott (1) give bare sloping ground at Mickleham, in moss at the roots of *Teucrium scorodonia*, and in grass-tufts. Its brachypterous form is very rare (J. Sahlberg).

Distribution. This pretty little species occurs in both Europe and Siberia, but, apparently, it is nowhere common. In Britain it is rare ; the only records are from the coast counties from Norfolk to Dorset, except Essex, and from Cumberland, Yorks, Bucks, Berks, Surrey, and Cornwall.

Sub-family II. Metacanthina.

Only eight Palaearctic species of these exceedingly elegant insects have been described, and we possess two of them. Many additional species occur in the other zoological provinces. They have an obvious resemblance to Diptera of the families *Tipulidae* and *Culicidae*. Our species have green larvae and are phytophagous in habits. As a whole, the sub-family manifests a tendency to the development of spines on the fore parts, and of a projecting tubular passage at the orifice of the scent-glands.

67. **Metatropis rufescens** H.S.

H.S. Nom. Ent. i, 43 (1835); D. & S., B.H. 148 (1865); Saund., H.H.B.I. 66 (1892).

Ova. Unknown.

Larvae. I have found these larvae on several occasions, and a description of four instars follows; there is, I believe, a fifth, which is intermediate between the first and second described, i.e. the fourth in order of development.

Last instar, length 7 mm. Elongate, similar in form to imago; shining green, with the wing-pads testaceous, tipped with darker; a pair of indistinct brownish quadrate blotches on each of the last three segments of the abdomen; legs testaceous and thickly spotted with black or brown, the femora only slightly clavate; antennae similarly spotted, with the first joint scarcely at all clavate, and last joint black, both antennae and legs proportionately thicker than in the imago, the two tarsal joints subequal; underside green, and sides of head streaked with reddish; rostrum testaceous with tip black; eyes red; behind the transverse sulcature of the head are a pair of red spots, indicating the position of the future ocelli; pronotum six-sided, with many sulcations, but no puncturation; wing-pads rather long, extending much beyond level of posterior coxae, although still very small for the large wings that are to come from them.

Third instar, 4 mm. Very similar to above, but with quadrate pronotum, and much shorter wing-pads, which do not pass beyond the level of posterior coxae; also legs and antennae more thickly spotted; two tarsal joints subequal.

2nd instar, $2\frac{3}{4}$ mm. Yellowish-green; antennae and legs almost black, spots hardly discernible; pronotum rectangular and very transverse; wing-pads present but very short; no ocellar spots; tarsi about one-third as long as tibiae.

1st instar, $1\frac{3}{4}$ mm. Yellow, with smoky-black legs and antennae; legs stout and of uniform thickness throughout; thoracic segments nearly equal, narrow and parallel-sided; tarsi half as long as tibiae, with basal joint shorter than terminal.

It will thus be seen that in the course of development the colour changes from yellow to green, the legs and antennae become lighter and their spots become more and more perceptible; the pronotum is developed proportionately to a much greater extent than the rest of the thorax; the legs become relatively longer, while the tarsi grow but little; the basal tarsal joint from being the shorter of the two becomes ultimately by far the longest of the three that occur in the adult form; the wing-pads always remain relatively small, considering the great size of the flight-organs to which they give rise; and finally the ocellar spots first appear in the third instar. J. Sahlberg gives the following brief description of the larva: "Flavescens, obsolete fusco-variegata, antennis, tibiis, tarsisque infuscatis, femoribus flavis, dense fusco-maculatis."

These insects are very easy to rear, and the following account of Mr. Moncreaff's experiences will show the *modus operandi*. I may add that I have found these larvae very fond of sucking the seed-capsules of the food-plant.

Mr. Moncreaff found about two dozen small larvae on *Circaea lutetiana* in June, 1871, and wishing to try his hand at rearing them he carefully dug up some of the plants, which he took home and potted; he then put the larvae upon the plants and covered the whole with a gauze-topped cylinder and left them to their fate. The next day he saw "some of them with their proboscides buried in the soft flower-buds"; they fed up well, giving no trouble beyond that of occasionally watering the plants, and were full-fed by the end of August. They changed their skins three times in captivity. The ecdysis is described by him as follows: "As the creature increases in size the skin gets too short for it, and the anal extremity becomes drawn up somewhat over the abdomen; it now fixes itself firmly by its claws to a leaf or stem of the plant, head downwards; the head is bent under, the antennae are laid along between the legs, and the larva appears to forcibly straighten the abdomen, the pressure causing the skin behind the head to split, and the thorax to be protruded through the opening; leg after leg is slowly drawn out, the head and antennae following; the wing-cases and wings are drawn down to their proper proportions; the imago then remains suspended by the last segment; in a short time it extricates itself entirely, but is some time before coming to its proper colour and firmness."

Life-cycle. Commander Walker (6) found specimens paired in June in the New Forest. As seen from Mr. Moncreaff's experiences, the eggs hatch in June, and the larvae mature in late August or early September.

Champion (4) records beating a specimen from hawthorn blossom on May 30th, and Dale (2) records taking four specimens in a copse at Glanvilles Wootton in June. These were evidently over-wintered specimens. Mulsant and Rey say that it hibernates in moss and at the foot of trees. The life-history, therefore, is similar to that of the Berytina.

Habitat, etc. The food-plant of this insect is the Enchanter's Nightshade (*Circaea lutetiana* L). It is a very local species, for, although its food-plant is one of the commonest ornaments of our woods and wayside banks, the insect is of by no means equally wide distribution. I took a few specimens on August 27th, 1896, in a damp place in a wood near Ewhurst, Surrey. There are very little *Circaea*, and much bramble and *Mentha hirsuta*. But in August, 1899, I found the species commonly amongst a small quantity of *Circaea* in a wood on the Downs at Abinger Hammer, near Gomshall, Surrey. Almost every small patch of the food-plant had its quota of bugs. The plants were growing underneath beech trees, and it was interesting to note how strongly the adult bugs, when at rest on their food-plant, resembled the fallen leaf-bud scales of the beech trees, several of which also were resting on the plants. The legs of the insects were practically invisible, and the shape and colour of the body were very much those of the beech scales. The greater number of specimens in this colony were mature before the end of August. The insect carries its antennae elevated and almost straight, and the body is much raised by the legs. In August, 1915, I found it fairly common on *Circaea* in woods in Bucks, but all were larval. I was able to rear several on potted plants of *Circaea*. Again in 1918 I found it equally common in damp woods in South-east Oxon ; these also were mainly larval, but many of them were reared.

It is recorded by Marshall as taken by sweeping fern in the New Forest, and Morley (1) also found it there in a swampy wood. Walker (6) speaks of it as taking readily to wing, when it bears a strong resemblance to one of the small light-coloured *Tipulidae* of the genus *Limnobia*, which are common in damp, shady places.

J. Sahlberg gives the food-plant as *Linnaea borealis*.

Distribution. It occurs throughout Europe, but in Britain it is recorded from nine counties only, viz. Durham (Power Collection), Kent, Surrey, Sussex, Hants, Dorset, Berks, Oxon, and Bucks, so that its head-quarters are a small and compact area, mainly south of the Thames.

68. **Metacanthus elegans** Curt. (M. punctipes Osh. Cat.).

Curt., B.E. iv, pl. 150 (1827) ; D. & S., B.H. 146 (1865) (punctipes) ; Saund., H.H.B.I. 65 (1892) (punctipes).

Ova. An egg taken from the body of a ♀, and about ¼ mm. in length, was of a honey-yellow colour, of a short and stout cylindrical shape, broadly rounded at one end and more narrowly so at the other ; chorion shiny, and covered with short ridges placed more or less parallel to the length of the egg.

Larvae. The nymph is structurally very similar to the adult, but it has a black head and pronotum, and a bright green abdomen.

Larva 2½ mm. long, probably in third instar ; head globose between eyes, pronotum trapezoidal, very transverse, abdomen broadest behind middle ; the whole upper surface clothed with long, scattered, clavate hairs ;

on the pronotum there are four of these on the anterior margin and six on the posterior; legs and antennae banded with brown; first antennal joint with four bands, second with two, one at each end, third with two, one behind the middle and one at apex, terminal joint brown except at base; femora, anterior with three bands, intermediate and posterior with six; tibiae dark at base and apex, anterior with three bands, intermediate with five, posterior with six to eight; no wing-pads.

Larva $3\frac{1}{2}$ mm. long. As before, but with a blunt spine in centre of pronotum behind, and a pale longitudinal, rounded carina on scutellum; wing-pads present, rounded and globosely swollen at apex; bands on antennae and legs more numerous; basal joint of antennae with six to eight, second with three, third with four, apical joint entirely dark; anterior and intermediate femora with about six bands, posterior with about eight; tibiae dark at base and apex, anterior with four to six bands between, intermediate with six, and posterior with ten.

The hairs have almost disappeared in this instar, only a very few quite small ones being traceable. Except for the terminal joint, the diameter of the antennae is greater in this instar than in the adult, and the bands are much more prominent; in the adult they remain in the basal joint only, and even there they are much smaller. The same reduction in size is noticeable in the bands of the legs. In this instar the only representative of the long scutellar spine of the adult is the above-mentioned pale carina, which is raised only very slightly above the general surface.

Life-cycle. The larvae may be found in July and August, and the insect matures in the latter month, and may be found also in September. The imago has also been taken in April (Dale), and in January (Billups, 3), and on the Continent in July. There are records also for May and June. From these data one may conclude that the life-history is similar to that of the Berytina.

Habitat, etc. This very delicate insect is always found on or under *Ononis spinosa*, and where it occurs it is gregarious and usually abundant. At Sandown, I.W., I have found it under the *Ononis* where that grows on sandy soil, but not where the soil is of clay, even although these two kinds of soil, with the accompanying plants, are situated near to one another (Morey's Guide). Thus the insect evidently possesses a selective power, and chooses by preference a sandy soil. The loose sand always clings more or less to its hairy legs, whereby it is rendered less inconspicuous than would otherwise be the case, and hence one would suppose there must be some counter-balancing advantage to lead to the selection of so loose and apparently unfavourable a habitat. When cleaned of the sand grains it is difficult to see, because of the extreme thinness of its limbs and the absence of any distinctive coloration, until the light happens to catch its hyaline hemielytra at the proper angle, and the shining, glassy surface becomes evident. When disturbed in its habitat it does not seem very comfortable, and its movements appear to be hampered by the looseness of the soil and the readiness with which the sand grains cling to its limbs. Here then we seem to see an insect which flourishes in spite of unfavourable surroundings.

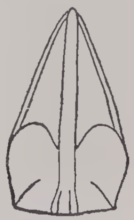
Morley (4) states that it freely takes flight, and that its flight resembles that of a *Culicid* gnat. Bedwell records it as abundant at the roots of marram grass on Kessingland sandhills, Suffolk. Dalla Torre found it on nettles.

Distribution. It occurs chiefly in Central and South-eastern Europe, but is found also in Algeria and Turkestan; in Britain it is recorded from all the coast counties from Norfolk to Glo'ster, as well as from Cumberland, Lancs, Oxon, Bucks, Herts, and Surrey; in Wales it has occurred in Carnarvon, Merioneth, and three southern counties—Pembroke, Carmarthen, and Glamorgan. It is also included in Mason's list for the Isle of Man, and Luff gives it as very common in Alderney. But there are no records for Scotland or Ireland.

Family IV. **LYGAEIDAE** (Myodochidae).

Of the 523 Palaearctic species which Oshanin catalogues in this extensive family we possess but a paltry sixty-five, and the family is probably as poorly known amongst us as any of the Heteroptera. The small size of many of the species, the obscure coloration of the majority, and the retiring habits of almost all have no doubt largely contributed to such a result. We have not even the redeeming feature of the extreme brilliance of the large and beautiful genus *Lygaeus*, which is so well represented on the Continent, to impart some interest to the study of the family. And yet there are many curious problems connected with their biology, notably the great variety that exists in the matter of pterygo-dimorphism, and the prevalence of the curious phenomenon of oligomery of the antennae. It is to be noted that when the membrane is reduced or missing in these insects, i.e. in the brachypterous forms, the ocelli also are missing; and in fact, even in some of those that are otherwise fully developed, the ocelli are either very small or sometimes absent altogether.

According to Tullgren, the auditory hairs in this family are situated as follows: three on each side of the centre of the second and third ventral sternites of the abdomen; similar pairs on the next two, but behind the spiracles; and two on each side in a similar position in the sixth segment.



Saw-case of *Eremocoris podagricus* F.

The ovipositor consists of a triangular or pyramidal saw-case lying beneath a pair of plates and attached by its base at the end of the abdomen to a kind of handle which is articulated to the body at its upper end, and on to which the saw can be folded back so that its free end points forward. Hence it must work in the opposite way to the saws of the *Capsidae*, which have their point of attachment some distance up the abdomen and their free end behind. The saw-case consists of two triangular plates containing the nearly straight saws between them.

From the existence of these saws one may assume that, whatever be the nature of the food, the eggs are laid in incisions made in the stems of plants.

The *Lygaeidae* are mainly dwellers upon the ground, and appear to affect sandy localities by preference ; some few, however, are addicted to marshy ground, and three only, belonging to the genera *Gastrodes* and *Ischnorhynchus* are inhabitants of trees. There is scarcely any direct evidence as to the nature of their food, but it may be expected that those which are attached to special plants are vegetarian in diet, though of course this does not necessarily follow. When a species of this sort becomes very plentiful and preys upon cultivated plants it may become of serious economic importance, as, e.g. the "Chinch Bug" of America, a pest of the grain crops. But no British species are yet known to be destructive in this way. On the other hand, many species, especially amongst the Aphanina, have particularly strong forelegs, which are very muscular and well provided with spines on the underside of the femora, amongst which the tibiae can be folded back, thus making a clutching organ which makes one strongly suspect that they are raptorial in function and that the insects are carnivorous.

In most species other than the Lygaeina the chitin forming the exoskeleton of the adult is particularly hard and strong and well calculated to resist any blows or other accidents that the vicissitudes of life may bring.

Of the eight sub-families to which our British species have been referred, the Aphanina claim nearly five-sixths of the entire number, and the other sections are very scantily represented, in some cases by a single genus, or even a single species. It is curious that the genus *Geocoris*, so largely represented on the Continent, has not yet been observed in Britain.

Guérin and Péneau have the following remarks about this family : "Essentiellement phytophages, affectionnant toutes sortes de plantes, de fruits, des premiers jours du printemps jusqu'à la fin de l'automne, il est facile de les recueillir au fachoir pendant toute la belle saison. Beaucoup d'espèces se trouvent l'hiver sous les mousses et les écorces ; il nous est encore impossible de dire si ce sont là des hibernants ou seulement des larves d'automne, arrivées depuis peu à l'état adulte de quelques-unes d'entre elles en octobre et novembre."

Sub-family I. **Lygaeina.**

Of the sixty-three catalogued Palaearctic species belonging to this subfamily we possess three only, and one of these is probably merely an occasional visitant from the coast of France, where it is common, or possibly an introduced species. The number of species in the Zoological province rapidly increases as we travel southwards, and some become immensely abundant in individuals. Even in such cases the majority do not appear to be of any particular economic importance.

69. **Lygaeus equestris** Lin.

Lin., S.N. 447 (1758); Saund., H.H.B.I. 69 (1892).

Ova and **Larvae.** Not described.

Life-cycle. With us the imago has been taken in June, August, and September. There are continental records also for April, July, and October.

Habitat, etc. *L. equestris*, the sole British representative of the twenty recorded Palaearctic species, has usually been taken on flowers, such as *Umbelliferae* and *Centaurea*. On the Continent it is common on *Asclepias vincetoxicum* and *Seseli hippomarathrum*, neither of which plant is British. Dalla Torre found it on *Scabiosa*, Gredler mentions *Hyoscyamus*, and Schumacher *Nigella sativa*. Guérin and Péneau record it from Brittany on thistles in July and on the flowers of *Colchicum autumnale* L. in September and October. Some species of this genus, however, have been detected sucking the juices of caterpillars, so that, perhaps, after all, the present insect may be a carnivore.

Distribution. This handsome insect is only of occasional occurrence with us, and is probably merely a visitor from the Continent, where it is common. It is of very wide distribution, occurring over practically the whole of the Palaearctic Province and extending into the Punjab. Its records with us are as follows: Bath (Mitford) 1837; Devizes (Sidebotham), June, 1864; Dover (Hall), September 7th, 1886; Sheppey (Jacobs), September 22nd, 1906, on a flower-head of *Centaurea nigra*, on a landslip about 4 miles from Sheerness; St. Margaret's Bay, Dover (Beare), August 29th, 1907. Prof. Hudson Beare, speaking of this capture, says that the insect was taken on an umbelliferous flower on the cliffs close to the Granville Hotel on a hot, sunny, still day; and referring to the theory above mentioned, of these insects being visitors from the Continent rather than natives, he adds that while he was in this locality the wind was never a favourable one for insects coming from the Continent to our islands. One must, however, remember the possibility of transport in shipping, for which the opportunities are very numerous. In this way also larvae might be transported even more easily than imagines, and if at the time they were near their final ecdysis there would be nothing to prevent their maturing on reaching this island, even if they could find no suitable food-plant. It will be noted that all the later captures were on the coast and in that part of the island which is nearest France.

70. **Nysius lineatus** Cost.

Costa. Cim. Cent., 3 & 4, 17 (1852); Saund., H.H.B.I. 70 (1892).

Nothing appears to be known of the early stages of this insect.

Life-cycle. The imago has been found with us in August and September.

On the Continent there are records from June to October. Horváth (6) records copulation as taking place in September, but there are no records of the adult between the October of one year and the June of the next.

Habitat, etc. The genus *Nysius* contains a large number of very closely allied species, twenty of which Oshanin catalogues as Palaearctic. The individual species also are variable, so that the genus seems to be still in process of differentiation. The fullest guide to the Palaearctic species is a paper by Horváth. This particular species frequents heaths, where it is found running on the ground, or may be taken by sweeping. Our British specimens appear to belong to the var. *brunneus* Fieb., the type form not being found with us. The type form is less reddish (flavescent grisâtre, Puton), has the nervures partly brownish instead of concolorous with corium, and is destitute of the small vague brown spot in the middle of the basal margin of the membrane, contiguous to the posterior margin of the corium, which occurs in the var.

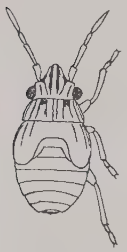
Distribution. The var. *brunneus* has been recorded from France, Germany, and Hungary, as well as our own country. The type form is spread over almost the whole of Europe, and extends eastwards into Siberia. The insect is rare with us, and our specimens come from three counties only, viz. Kent, Surrey, and Hants.

71. **Nysius thymi** Wolff.

Wolff. Ic. Cim., 149, 143, t. 15, fig. 143 (1804); D. & S., B.H. 226 (1865); Saund., H.H.B.I. 70 (1892).

Ova. Eggs taken from the body of a ♀ were 1 mm. in length, of an orange colour, long oval, rather pointed at the ends, and with smooth chorion; anterior end less pointed than posterior, and with a few small prominences.

Larvae. Last instar, 2¾ mm. Oval; head triangular, with prominent eyes; pronotum very transverse; fore parts pale flavous, with piceous and reddish-brown streaks; abdomen flavous, closely mottled with reddish-brown; the head has six piceous lines, with short reddish-brown ones between them on the vertex; pronotum with two central reddish-brown lines, and four piceous ones on each side, the two inner broad and partly confluent, the two outer narrow and abbreviated; wing-pads with about a dozen piceous lines, more or less confluent; lateral margins clear flavous; antennae stout, black, second and fourth joints sub-equal; femora, tarsi, and apex of tibiae dark piceous, almost black; apices of femora and greater part of tibiae yellowish; connexivum with an interrupted reddish-brown line just within margin; stigmata on margin of connexivum in middle of each segment; abdomen beneath coloured similarly to upper surface; claws abruptly curved.


Nymph of *Nysius thymi* Wolff.

A younger instar, 1¼ mm. Very similar to above, but without wing-pads.

Life-cycle. It matures rather earlier than many other of our *Lygaeidae*, and may be found adult from the beginning of August at least, and often earlier. J. E. Mason (6) speaks of immature examples as abundant at Mablethorpe on July 6th and 25th, 1889. Bedwell has found the imago in September. Curtis records it as running quickly over the sandhills of Lowestoft in June. But, of course, these might have been over-wintered examples. With us copulation takes place in August, and in the act the insects are placed tail-to-tail, the ♂, which is the smaller, being dragged about by his partner. Horváth (6) states that on the Continent coupling takes place from June to September, and that the imago may be found in March and from May to September. He considers that this as well as the other European species passes the winter in the imago condition. Guérin and Péneau record it in October, and there is also a record for November, so that there are continuous records for all the months except December, January, and February, when few entomologists are doing field work.

Habitat, etc. Wherever this insect occurs it is gregarious and plentiful, and may be found running on the ground or by sweeping amongst low herbage. Mulsant and Rey state of the various species of this genus that they usually live at the foot of the plants whose juices they suck, each species being apparently associated with a different plant. The present species is described as occurring on the Continent amongst wild thyme (*Thymus serpyllum* L.), whence its trivial name. But that certainly does not describe its usual habits in this country. I have never found it associated in any way with thyme, but Norman obtained it from thyme in Scotland. It generally prefers sandy places, not necessarily on the coast, where it runs about on the ground amongst the stunted vegetation of whatever kind; it has also been taken amongst *Erodium* and on *Achillea* and *Echium* (Morley, 4), and by sweeping heather (Parfitt). Schumacher (5) records it in Germany from *Artemisia*. When on the ground it is not easy to detect, as its coloration harmonises well with the environment. It is active in its movements, and is sometimes found in the utmost profusion. It varies greatly in size, and apparently also in the proportions of the body. The form known amongst us as *maculatus* D. & S. has the pronotum shorter and therefore more transverse than the type, and occurs with it. Newbery once found at Felixstowe, amongst *Silene inflata*, a small form, which, however, is apparently another of the numerous vars.

It has been found afflicted with oligomery of the antennae. Nothing is certainly known as to its food. An allied species in the United States, *N. angustatus* Uhler, has been " found damaging the grape-vine, strawberry, young apple grafts, potatoes, turnips, radishes, beets, cabbages, lettuce, and other plants. It seems to prefer cruciferous plants and to avoid grasses and cereals. Potato leaves infested by these insects show little rusty and circular specks or holes wherever the beak has been inserted" (Lugger).

Distribution. This species is very widely distributed, occurring all over Europe, in the north of Asia, and also in British N. America. It extends north to the parallel of 69°. Speaking of the occurrence of this and other Palaearctic species in N. America, Horváth (3) points out that it is impossible to regard species whose food-plants have not been articles of merchandise and import as imported species, but their occurrence in the Nearctic Province is, he considers, due to migration by way of Behring Straits, as all such species occur in Siberia. In Britain *N. thymi* has been recorded from all the coast counties from Northumberland round to Cornwall, except Hants, and also from Cumberland, Lancs, Cheshire, Notts, Leicester, Northants, Glo'ster, Bucks, Berks, and Surrey; from the counties of Carnarvon, Merioneth, Carmarthen, and Glamorgan in Wales; from the Scilly Is. (Champion, 3a), Jersey (Butler, 52), and the Isle of Man, but not from the Isle of Wight; and it extends into both Scotland and Ireland. The absence of any records from Hampshire is very noteworthy, especially as that is one of the very few counties in which *N. lineatus* is found. It is rather curious that *N. senecionis*, which is commoner in France than *N. thymi*, has not yet been found with us.

Sub-family II. **Cymina.**

This is a small sub-family of thirteen short-legged species, so far as the Palaearctic fauna is concerned, and we possess the good proportion of nearly one-half of them. They are all associated with plants and are mostly taken by sweeping. Where they occur, they are usually abundant. They are deeply punctured, and the arrangement of the punctures is an important element in their identification.

72. **Cymus glandicolor** Hahn.

Hahn, Wanz. i, 79, c. 12, fig. 45 (1831); D. & S., B.H. 236 (1865); Saund., H.H.B.I. 71 (1892).

Ova. Unknown, but see No. 75.

Larvae. The larva bears some resemblance to the fruit of Carices. Last instar, $3\frac{1}{3}$ mm. Oval, somewhat acuminate at each end, reddish or brownish ochraceous, shaded with brown on pronotum, and with apex of wing-pads fuscous; upper surface glabrous and finely rugose in more or less transverse lines; both upper and undersides with large, round, pale spots, generally more distinct on underside; underside pilose towards end of abdomen; head pentagonal, convex, central lobe of face extending far beyond side-lobes; eyes dark red; pronotum transverse, trapezoidal, with posterior angles rounded, sides distinctly margined, the margin ochreous; wing-pads extending rather more than half-way down the body; connexivum ochreous ; two pairs of black spots on dorsum of abdomen in the region of the scent-glands ; antennae black, four-jointed, first joint short and stout, second and third cylindrical, of equal thickness, narrower than first and fourth, second longer than third, fourth stout, skittle-shaped, rather longer than second ; femora dark brown, pale at apex, tibiae cylindrical, ochreous, with blackish apex ; tarsi two-jointed, black, second joint the longer, claws strongly and abruptly curved.

Life-cycle. The perfect insect appears in August, and there are records of its having been taken in every month except February, March, November, and December. T. R. Billups (3) took it in January. Thus it evidently hibernates as imago, and presumably oviposition would take place in spring.

Habitat, etc. It is an inhabitant of damp places, where it is obtained by sweeping amongst luxuriant vegetation generally. Morley (4) records it from *Carex paniculata* L. at Foxhall, Suffolk, and Halbert from flags in Ireland. Linnell records it from the bottom of haystacks, but unfortunately the time of year is not specified, though one would imagine this to be a case of hibernation. Horváth records one specimen beaten in August from *Picea excelsa*. Péneau took it on flowers in July. J. Sahlberg gives species of *Carex* as food-plants, and with this agrees the resemblance of the larva to the fruit of those plants.

Puton thus describes a var. of this species under the name of *marginatus* : " Dessus du corps brunâtre ; ligne médiane et côtés du pronotum roussâtres ; carène de l'écusson blanchâtre ; marge des élytres blanchâtre, cette teinte blanchâtre s'étend sur le tiers extrème de la mésocorie ; clavus entièrement brunâtre ; bord apical de la corie noirâtre, ainsi que l'angle apical externe ; dessous du corps et ventre brunâtres."

This var. has not yet been found with us.

Distribution. It is distributed through Europe and Siberia, Algeria, Asia Minor, and Turkestan, reaching the northern parallel of 65°. In Britain, also, it is widely spread, being recorded from the coast counties from Norfolk to Cornwall, from Cumberland, Yorks, Cheshire, Notts, Cambs, Warwick, Glo'ster, Oxon, Wilts, Herts, Berks, and Surrey, from S. Wales (Glamorgan and Pembroke), and from Ireland, but there are no records from Scotland.

73. **Cymus obliquus** Horv.

Horv. W.E.Z. 310 (1888) ; E.M.M. xlv, 59.

C. obliquus agrees with *C. glandicolor* in having a distinct pale central carina to the scutellum, but is a smaller and less elongate insect, having a length of 3¾–4 mm. as compared with the 4½–5 mm. of *C. glandicolor*. It also differs in having the pronotum rather more convex and raised posteriorly, the hemielytra shorter, with more rounded sides, the membrane much smaller, and its suture with the corium considerably shorter. The apex of the corium is fuscous, and the faint fuscous streak on hinder half of corium is placed obliquely and not parallel to the sides as it is in *glandicolor*. I have examined the genital styles of the two species, and find that they differ slightly, those of *obliquus* being blunter and thicker. This is the insect referred to in the second note to *C. glandicolor* in Saunders' "Hem. Het. Br. Is."

Ova. Unknown.

Larvae. Darker than those of *C. glandicolor.*

Life-cycle. The imago appears in August, and has also occurred in May, June, and September.

Habitat, etc. I have found *C. obliquus* on *Solanum dulcamara* L. Horváth describes it as occurring in damp meadows in France, and says that it is often accompanied by *C. glandicolor.*

Distribution. This species has hitherto been found chiefly in Central and Southern Europe. It occurs also in Turkestan. In Britain, so far as I know, it has been found only in Sussex, in the Hastings District, except for one specimen which I have from Gomshall, Surrey.

74. **Cymus melanocephalus** Fieb.

Fieb. E.H. 203 (1861); Saund., H.H.B.I. 72 (1892).

Of the early stages I have no information.

Life-cycle. The imago has been taken from June to September.

Habitat, etc. This is rather a local insect, but where it does occur, it is plentiful. It is taken by sweeping in damp places on rushes, and also by evening sweeping (Saunders). Amongst many specimens I took at Gracious Pond, Chobham Common, there are two with a malformation of the antennae somewhat different from the examples of oligomery which are usually met with amongst the *Lygaeidae;* in each case one antenna is considerably shorter than the other, though the normal number of joints is present. In one of these specimens the first three joints are shortened, the second and third being also thickened and darkened, and the fourth is of the normal form and size; the other has the first joint normal and the remaining three shortened, the second and third being also thickened and darkened. These peculiarities seem to imply a too rapid stiffening of the cuticle at the last ecdysis, whereby the joints in question were prevented from being fully extended by the passage of blood into them.

Distribution. This species belongs chiefly to Central and Southern Europe, where it is common in many places. It occurs also in North Africa, Asia Minor, and Turkestan. In the British Isles it has been found in six counties only, Norfolk, Warwick, Surrey, Sussex, Hants, and Dorset, of which Surrey seems to be its metropolis. As it is very similar in the net to *C. claviculus*, it may perhaps have been passed over elsewhere.

75. **Cymus claviculus** Fall.

Fall. Mon. Cim. 64, 4 (1807) ; D. & S., B.H. 235 (1865) ; Saund., H.H.B.I. 72 (1892).

Ova. " 8 mm. × .2 mm. Allongé, linéaire, hyalin, verdâtre, marqué sur son tiers antérieur de légères incisions longitudinals, qui n'atteignent pas le bout, à pôles arrondis, à coquille délicate. Œufs pondus en petit nombre, dont l'éclosion se fait quelques jours après la ponte, donnant au jour un être faible, à téguments mous, et qui se fixe aussitôt sur la plante nourricière pour en aspirer le suc " (Xambeu).

Larvae. The young larva is yellow and becomes olivaceous as it reaches its penultimate stage.

Life-cycle. The imago matures in August, but it has also been met with in July, September, and October, as well as in April (Morley, 4) and January (Billups, 3). Thus the insect evidently hibernates as imago. The records are continuous from April to October. Copulation, according to Xambeu, takes place in June in the sunshine, on the top of the rushes, the ♂ being first above, and then tail-to-tail. The ♀ lays her eggs next day, placing them indiscriminately on the stems of the rushes, or amongst the inflorescence.

Habitat, etc. This species apparently spends its early life, at least, on the ground, under various plants, though when adult it is obtained by sweeping. I once found a large colony, in all stages, under *Polygonum aviculare* L. at Battle, Sussex (Butler, 3), and another under *Juncus bufonius* L. on a mud-flat at Dallington, Sussex. Morley (4) records it from the roots of *Aira caespitosa* L. and other grasses in Bentley Woods, Suffolk, in April. In France, Xambeu records it on " les grappes florales des joncs qui poussent dans des terrains humides." Amyot and Serville mention it as common in spring in sandy fields, and Guérin and Péneau found it in moss in winter. I once found in some numbers a small var. of this species on a heath near Chilworth, Surrey ; it was darker than the usual form, and in that respect was more like *C. melanocephalus*.

Distribution. This is a very widely distributed species, occurring throughout the greater part of the Palaearctic Province, and extending into N. America. It is also common and widely distributed in the British Isles, having been recorded from all the coast counties from Norfolk to Somerset, and then from Monmouth, Glamorgan, and Carmarthen ; also from Warwick, Hereford, Bucks, Berks, and Surrey, and finally from Ireland. Thus its recorded distribution in Britain is not very unlike that of *C. glandicolor*, though not quite so widely extended, and the kind of locality it frequents is different.

76. **Ischnorhynchus resedae** Pz.

Pz. F.G. 40, 20 (1797) ; Saund., H.H.B.I. 73 (1892).

Ova. Unknown.

Larvae. 2½ mm. ; probably fourth instar. Reddish ochreous, with the fore parts darker and shagreened ; margins of abdominal segments pale ; a transverse row of large pale spots on each segment, together with a number of similarly coloured minute, scattered spots ; pronotum with a pale central line. Three black bars in area of scent-glands ; head convex, triangular ; pronotum trapezoidal, with narrow explanate margins which are yellow ; wing-pads short with yellow explanate margins ; the fore parts are set with minute white setae.

Life-cycle. I found larvae on birch trees at St. Martha's Hill, Surrey, August 24th, 1899, and also in Herefordshire on alder in the same month. In the former instance imagines were present as well. Both Bedwell and I have taken the imago in June, and Dale in September and October. Reuter speaks of it as found on *Picea excelsa* in spring before the appearance of the leaves on deciduous trees, and in autumn after their fall. Lethierry found it in N. France in April and May on pines, and Autran in Switzerland in September on juniper. Bellevoye has several times taken it in France on the pollen-covered flowers of Coniferae, and Reuter found a specimen in November on *Calluna* (Reuter, 19). From the above records, it would seem that there is scarcely a month in the year when imagines may not be met with ; in fact, the records are continuous from April to November. The larvae are evidently produced during the summer and mature as a rule some time in August, and as winter approaches, the imagines leave deciduous for evergreen trees, in which they pass the winter, performing oviposition presumably in the early summer.

Habitat, etc. This insect is found on various trees, and may be obtained by beating. Birch seems to be the chief favourite, but it has been discovered also on alder, and on shrubs and low plants such as furze, *Sedum*, and *Aster tripolium* L. (Morley, 4). Schilling found it in spring on birch, apparently either before the leaves appeared, or while they were still quite small. Puton says it occurs between the scales of the male catkins of the birch. Dalla Torre took it on *Scabiosa*. Guérin and Péneau found it in winter on furze, and also on conifers in many places. J. Sahlberg gives *Ledum palustre*.

Distribution. This is another very widely diffused species, appearing not only in the greater part of the Palaearctic Region, but in North America as well, and extending in Lapland to 63° 20′. In Britain it is recorded from all the coast counties from Lincs to Cornwall, and from Leicester, Glo'ster, Bucks, Surrey, and Glamorgan ; it is also found in both Scotland and Ireland.

77. **Ischnorhynchus geminatus** Fieb. (I. ericae Horv. Osh. Cat.).

Fieb. Eur. Hem., 199, 1 (1861) ; D. & S., B.H. 233 (1865) (resedae) ; Saund., H.H.B.I. 74 (1892).

Ova. Egg taken from body of ♀ reddish-yellow, parallel-sided, rounded at ends, surface covered with fine longitudinal furrows, numerous and close together. Length, $\frac{2}{3}$ mm.

Larvae. Last instar, $2\frac{1}{2}$ mm. long. Head triangular, pronotum transverse, with rounded explanate lateral margins; body long oval; colour reddish-brown, more or less mottled with ochreous, especially in abdomen; surface dull and very indistinctly shagreened, with scattered, short yellow setae; lateral margins of wing-pads and pronotum yellow; legs and antennae concolorous with fore parts; tarsi two-jointed; antennae four-jointed, last joint stouter than the rest, fusiform, slightly longer than second; dorsal openings of scent-glands transverse; an impressed line joining each pair; surface on each side of it fuscous; underside concolorous with upper.

Previous instar, $1\frac{3}{4}$ mm. Very similar to preceding, but with much shorter wing-pads.

Life-cycle. The insects mature by August at the latest, and the larvae are to be found in July. There are records for the imago for all the months from April to October, and from the Continent one record for December. The insect therefore hibernates as imago, and as the imagines appear again in April, the probability is that oviposition takes place in spring or early summer.

Habitat, etc. Notwithstanding their very close resemblance in structure and appearance, this species and the preceding differ entirely in habits. The present insect is almost confined to heaths, living on both *Erica* and *Calluna*, and is very seldom found elsewhere. I have, however, taken it on willows near Maidenhead. According to Guérin and Péneau, it occurs in December on the flowers of rushes, and it has been taken on *Abies excelsa* and *A. alba* (Reuter, 19). But there can be no question that its most natural association is with heaths, where it usually occurs in profusion, crawling about over the tufts of *Erica* and *Calluna*, and readily taking wing. It is strange that notwithstanding the great abundance of the insect there seem to be no authentic records that anyone has ever noticed it feeding, or can say whether it actually sucks the juices of the heath plants or merely frequents them in order to prey upon other creatures that are found there.

Distribution. This insect is far less widely distributed than the preceding, for, according to Oshanin, it occurs only in France, Germany, Spain, Italy, and Greece, besides our own country. In Britain it is the commoner of the two, and is usually abundant wherever it occurs, though large stretches of heath may be without it. It has been recorded from the coast counties extending from Northumberland to Cornwall, except Essex and Dorset, and also from Cumberland, Lancs, Cheshire, Leicester, Bucks, Berks, and Surrey, and from Carnarvon in Wales. It is recorded from Scotland but not from Ireland. It occurs commonly in the Channel Islands, even in the smallest of them.

Sub-family III. **Blissina.**

Of the eighteen Palaearctic species of this sub-family we possess only one, and that is a rare insect. To this section belongs the well-known "Chinch Bug" of America, the pest of the grain-fields, and so far as their habits are known they are vegetable-feeders. They are chiefly long, narrow, short-legged insects.

78. **Ischnodemus sabuleti** Fall.

Fall. Hem. Suec., 62, 23 (1829); D. & S., B.H. 220 (1865); Saund., H.H.B.I. 75 (1892).

Ova. Of these I have no information.

Larvae. Last instar, 4 mm. Elongate, parallel-sided; head and pronotum black with a slight metallic lustre, lateral margins and posterior angles of the latter yellowish; wing-pads brownish-black with apex and hinder part of lateral margins yellowish-white; metanotum between wing-pads yellowish, slightly tinged with reddish-brown; abdomen pinkish-red, first three segments deep chocolate-brown for almost the whole breadth between the broad connexiva of the two sides, fourth segment with a transverse diamond-shaped patch, and fifth segment with a triangular mark of the same colour, the last half of the sixth segment and all the rest of the abdomen behind that black with a slight metallic lustre; stigmata and scent-glands black; head broader than long, triangular; pronotum transverse with rounded sides, deeply emarginate in front, slightly so behind, with a fine central furrow; the whole upper surface with a short yellowish pilosity; legs shiny, deep chocolate-brown, with apex of femora and tibiae and first tarsal joint yellowish; tarsal joints two, the second larger than the first, claws strongly curved; antennae four-jointed, shining brownish-black, the joints yellowish at extreme base; eyes red. Described from larva taken by Mr. Newbery and kindly presented to me.

According to Guérin and Péneau the larva is developed in the rolled-up leaves of *Calamagrostis arenaria.*

Life-cycle. The imago occurs from June to September, and has also been taken in March. The "Chinch Bug" in the United States produces two generations per annum, the insects wintering as adults; pairing takes place amongst these in the spring, and a few days afterwards the ♀♀ begin to lay their eggs, continuing the operation for two or three weeks. The eggs hatch in about a fortnight, and the insects mature some forty or fifty days afterwards. By this time the corn is hard, so that for the autumn brood new vegetation is sought elsewhere (Lugger). But whether our British species follows a similar course is not known.

Habitat, etc. This insect is rare with us; it is found in damp places, such as amongst the roots of rushes; Janson took it by evening sweeping on June 3rd, 1895; Fieber (2) says it occurs on *Arundo phragmites;*

Schumacher (8) found it on *Calamagrostis epigea;* Puton (3) gives *Cistus*, and J. Sahlberg on *Elymus arenarius*. It is dimorphic, and in the brachypterous form, which is the usual one, the hemielytra are much abbreviated and the membrane is reduced to a mere margin; the wings are aborted. The Power Collection contains macropterous specimens and so does the Douglas Collection, which is now in the possession of Mr. Willoughby Ellis. Some specimens show oligomery of the antennae such as is described in detail under *Scolopostethus affinis*.

Distribution. This is the only one of the Palaearctic Blissina that is generally distributed; it occurs throughout Central and Southern Europe, and passes into Western Asia. The brachypterous form extends to the parallel of 66°, and the macropterous almost as far. In Britain I know of only five records, Folkestone (Douglas), Merton (Power), Epping Forest (Newbery), Hatfield (Janson), Berks (Walker). Thus it belongs to the south-eastern corner of England, and has occurred in five counties, Herts, Essex, Kent, Surrey, and Berks.

Sub-family IV. **Henestarina.**

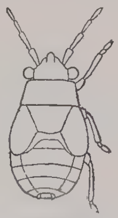
The members of this small section are easily distinguished by their pedicellate eyes. Only ten Palaearctic species have been catalogued, and of these we have two, which are much alike. They are ground species and littoral in their habits.

79. **Henestaris laticeps** Curt.

Curt., B.E., p. and fig. 597 (1836); D. & S., B.H. 229 (1865); Saund., H.H.B.I. 75 (1892).

Ova. Unknown.

Larvae. Penultimate larval instar, 3½ mm.; pale ochreous, with scattered brown punctures, from each of which rises a very short, brilliant, yellowish seta; general surface, independently of the brown punctures, covered with a very close and very minute puncturation; wing-pads short; legs brown-spotted, with rather long, shining hairs; eyes rather prominent, but not pedunculated; antennae very stout, and brown-spotted throughout; last joint fusiform; body broad, widest just behind end of wing-pads; pronotum transverse, almost rectangular, with a central longitudinal carina, which is continued less distinctly through the scutellum.



Nymph of *Henestaris laticeps* Curt.

Last larval instar, 4½ mm.; the colour deepens, becoming more inclined to fuscous; general puncturation even finer than before, and the scattered brown setigerous punctures now black; pronotum showing four black spots in front, two of which are just behind the eyes; the eyes now become slightly pedunculate; wing-pads longer, and the scent-glands appear as two pairs of black spots, each pair joined by a fine black line.

Life-cycle. The larva matures in August and the imago has been found in August and September, and on the Continent in May. These latter are probably over-wintered specimens.

Habitat, etc. This is distinctly a coast insect, as well as a dweller upon the ground. It is often abundant where it occurs. It may be found at the edge or base of cliffs, where the vegetation is of the driest and most stunted character. Here it is well concealed by its resemblance to the ground which shows between the scanty herbage and along which it runs. Some years ago it was very abundant in this way at the edge of the cliffs west of Bexhill, Sussex, where the main part of the extremely stunted and scrubby vegetation consisted of *Plantago coronopus* and *Arenaria*. But since the formation of the parade at that rising watering-place the upper part of the cliff has been removed, and the insect has, of course, disappeared. I have also found it at the base of a low cliff in the same neighbourhood, where the only shelter was a tuft of *Arenaria*. On the black cliffs near Treknow, a village in the district of Tintagel, Cornwall, it is abundant even in the very driest parts. Douglas reports it from Seaford, Sussex, on thrift, both imagines and larvae occurring on the plants. But I have found it also in a salt marsh at Yarmouth, I.W., where it was running about in the bare, damp spaces amongst the maritime plants, especially *Atriplex portulacoides*.

When it occurs in dry places it runs spasmodically, seeming to realise that its greatest safety is in absolute stillness, when it is not easily distinguished from the ground on which it is resting, while movement, of course, at once betrays it. These remarks, however, do not apply when the insect is found in damp places such as the salt marsh above referred to. Here it runs about quite freely.

Distribution. Being a littoral insect, it is found chiefly in those countries of Central and Southern Europe which have an extended coast line, the only exception being a record from Hungary; it occurs also on the southern seaboard of the Mediterranean. In Britain it inhabits the coast counties from Essex to Cornwall, and also Pembroke, but has not been recorded from either Scotland or Ireland, and there are no inland records. It is found also in the Channel Islands.

80. **Henestaris halophilus** Burm.

Burm. Hand., ii, 292 (1835); Saund., H.H.B.I. 76 (1892).

Ova. Unknown.

Larvae. These are pale ochreous, as in the preceding species.

Life-cycle. The insects mature in August, but imagines have been taken also in June.

Habitat, etc. Like the preceding, this is a coast insect; but, unlike its congener, it frequents damp places only. In a salt marsh at Swalecliffe, near Whitstable, I found this species in profusion in August, 1897. It occurred at the roots of maritime plants, such as *Atriplex portulacoides*, and seemed by preference to seek out the wettest places. The locality has since been destroyed by a very high tide.

Distribution. It is less widely distributed than the preceding species, inhabiting Central Europe only, from France to Russia, and even penetrating into Asia as far as Turkestan, but it is not recorded from the Mediterranean Basin. In the British Isles it is far more local than *H. laticeps*, and is recorded from two counties only, Kent and Cornwall.

Sub-family V. **Artheneina.**

Of this small group of seven Palaearctic species we possess only one, and as the others are entirely southern, none of them are at all likely to be met with here. The one we have, however, is exceptional in its habits.

81. **Chilacis typhae** Perr.

Perr. An. Soc. Lin. Lyons, N.S., iv, 159 (1857); D. & S., B.H. 231 (1865); Saund., H.H.B.I. 77 (1892).

Nothing has been recorded of the form or appearance of the early stages of this insect.

Life-cycle. The imago has been found in August, September, and November. Beaumont took it in May, and it has also occurred in February; these records imply the hibernation of the adult insect.

Habitat, etc. It is found in the heads of *Typha latifolia*, the so-called bulrush, in which it lives in all its stages, and on which it may be presumed to feed. According to Mr. E. P. Collett (6), it occurs more commonly in the heads of a year old than in the fresh ones of the current year, and such specimens appear to be over-wintered individuals. This, however, does not accord with the experience of Mr. T. Edmonds, who finds it plentiful in the fresh heads. It delights to bury itself in the down of the bulrush heads, and the comparative flatness of the body renders this an easy diversion.

Distribution. This is a rare insect, and occurs chiefly in Central Europe. Of course its distribution is determined by that of its food-plant, but it is a very local insect, and can by no means be expected to occur wherever that plant grows. Thus, while the *Typha* is found throughout the greater part of Great Britain, from the North of Scotland to Cornwall, *Chilacis* has been recorded from eleven counties only, viz. Durham, Norfolk, Suffolk, Worcester, Glo'ster, Essex, Kent, Surrey, Sussex, Devon, and Glamorgan. No doubt it occurs in other places, but it is not always easy to get at the heads of the reed-mace and examine them, unless a boat is available. Where the insect does occur it is usually plentiful. At present it is not known from either Scotland or Ireland.

Sub-family VI. **Heterogastrina.**

This is another small sub-family, containing only ten Palaearctic species, and most of these belong to the single genus *Heterogaster*. We have but two British species, mainly southern insects.

82. **Heterogaster artemisiae** Schill.

Schill. Beitr., 88, t. 8, fig. 3 (1829); D. & S., B.H. 224 (1865); Saund., H.H.B.I. 79 (1892).

Ova. Unknown.

Larvae. The nymph is very similar in form to the imago, but far more brightly coloured, thus: Head and fore part of pronotum black; hind part of pronotum yellow; wing-pads fuscous at base, shading off into reddish ochreous at apex; abdomen yellow between the wing-pads, the rest reddish-fuscous, with a longitudinal cream-coloured blotch on each side; legs reddish, femora darker; antennae reddish, apical joint darker.

Life-cycle. The insect matures in August, and the larvae are to be found in July, a few running into the beginning of August before they make the final moult. It hibernates as imago, having been found in winter and spring taking refuge in cut pine branches. I have records for the occurrence of the imago from June to September.

Habitat, etc. The somewhat unfortunate specific name of this insect was given by Schilling because he found his first specimens at the roots of *Artemisia campestris*. The insect is generally captured by sweeping, and does not appear to have any special connexion with any species of *Artemisia*, and the above plant was used probably merely as a shelter. I took several specimens in August, 1899, in a chalk-pit on the Downs at Abinger Hammer, near Gomshall, Surrey, and there was certainly no *Artemisia* of any kind anywhere near. E. Saunders (29) reports it from moss. Reuter says it is found under different plants on sandy hills. Guérin and Péneau report is on *Tanacetum vulgare* L. It has also been found on juniper (Reiber and Puton). D'Antessanty has taken it in winter and spring by beating faggots of pine branches (Reuter, 19). Fieber (2) is the only author I have found besides Schilling who associates it with *Artemisia*, and probably his record is merely copied from Schilling. He says "under *Artemisia* and on *Coronilla*."

Distribution. This is a widely distributed species occurring in Central and Southern Europe and Algeria, and extending to Syria and Turkestan. In the United Kingdom it is decidedly local, being recorded from five counties only, Surrey, Hants, Dorset, Somerset, and Glo'ster, the first of which is its head-quarters.

83. **Heterogaster urticae** Fab.

Fab., S.E. 723, 129 (1775); D. & S., B.H. 222 (1865); Saund., H.H.B.I. 78 (1892).

Ova. Yellow, cylindrical, rounded at one end, truncated at the other;

laid on leaves in a mass adhering to one another and surrounded by a hardened whitish secretion ; surface of egg smooth.

Larvae. These are very much like the imago, and of a greenish-black colour. The cast skins show all the black markings very clearly, the greenish parts becoming white.

Life-cycle. I have found larvae in August as well as imagines. Again I have taken the imagines at the beginning of June. They have also been found abundantly in a hollow stem of furze in September, and again beneath willow bark in the winter (Morley, 4). I have found the imago in March at the roots of a tuft of *Iris pseudacorus* L. on the sandhills of Carmarthenshire, and there are continuous records of it from March to September, chiefly by sweeping. Hence this insect, like so many others, hibernates as imago, and when the nettles which constitute its usual resort die down in the autumn the bugs forsake the ruined plants and retire to places of security such as those mentioned above until the new crop of nettles arises in the following spring, when they come forth from their retirement.

Habitat, etc. The specific name, in this instance, is most appropriate, for the species is distinctly associated with nettles, on which it is often found abundantly. It has also been found under *Erodium* at Deal (Hall, 3), but it occurs there on nettles as well. Morley (4) records it from *Angelica* flowers, which were among nettles. Guérin and Péneau mention it as found in lucerne fields in August, and Snellen van Vollenhoven as occurring under *Salix repens* in the same month. It is a very active insect, especially in bright sunshine.

Two other species of very similar appearance are found on the Continent, but not commonly ; the present species may be distinguished from them by its banded legs.

The saw-case is a elongated triangle, black at its base and with the apical two-thirds yellow.

Distribution. It inhabits Central and Southern Europe and the southern coasts of the Mediterranean as well, and extends its area into Western Asia, but in Britain it is mainly a south country insect, being found in all the coast counties from Norfolk to Cornwall, in Oxon, Berks, Surrey, Middlesex, Herts, and Cambs, and in Glamorgan and Carmarthen in S. Wales. It also occurs in the Scilly Is. and in Hayling Is. Thus it is not recorded from farther north than Norfolk, and even in that county it is rare. It has, however, been found in Ireland.

Sub-family VII. **Aphanina.**

All the rest of our *Lygaeidae* come under this sub-family. It is a very large group, and upwards of three hundred Palaearctic species have been described. Of these we possess about one-sixth, representing at least twenty genera. They are mainly ground-loving insects and are mostly of obscure coloration. It is in this sub-family that we find the greatest number of the instances of pterygo-dimorphism, and therefore also of the absence of ocelli. The genera *Ischnocoris*, *Macrodema*, *Plinthisus*, *Acompus*, *Stygnocoris*, and *Scolopostethus* exhibit this phenomenon in the most marked degree, though in the last two instances only some of the species are thus affected. It is in this sub-family, again, chiefly that oligomery of the antennae occurs ; thus that defect is closely associated with ground-loving habits. In some genera, further, such as *Trapezonotus* and *Drymus*, there is a certain slight abbreviation of the membrane of the hemielytra. Add to these facts that very little is known of the life-history of the various species and it will be seen that this sub-family affords abundant scope for investigation, and raises many interesting questions. The ova of almost all the species are unknown, as well as the larvae of a large proportion. Such larvae as are known are much alike and have explanate lateral margins to the pronotum.

84. **Pamera fracticollis** Schill.

Schill. Beitr., i, 82, 27, t. 7, fig. 6 (1829) ; D. & S., B.H. 170 (1865) ; Saund., H.H.B.I. 82 (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Head pentagonal, black, very finely punctured on the vertex, with a short whitish pubescence and a few scattered long hairs ; eyes rather prominent ; central lobe of face broadening towards apex and projecting considerably in front of side lobes ; pronotum trapezoidal, widest behind, a transverse impression very near hind margin, dull black with two dull brownish spots behind ; lateral margins explanate, slightly sinuate, yellow with extreme edge dark ; front margin brownish, the whole surface except margins furnished with scattered silvery pubescence; scutellum rather long, brownish-black, with two paler spots at base ; wing-pads variegated with brownish-black and yellowish, with an explanate margin broader than that of pronotum, but similarly coloured ; abdomen variegated with brownish-black and yellowish, the region of the scent-glands black, each glandular area with two almost rectangular reddish-black velvety spots, separated by a dark yellowish area ; the whole abdomen with very short scattered pubescence ; underside blackish-brown except meso- and meta-sternum, which are yellow ; legs yellowish, apex of femora broadly and base and apex of tibiae narrowly infuscated ; front femora incrassated, with one moderate-sized and two small teeth beneath, tarsi two-jointed, basal joint yellow, apical infuscated ; antennae four-jointed, shining brown, pilose, especially second and third joints. From this it will be seen that at the last moult the thorax loses its explanate border, the fore part becomes narrower in proportion to the hinder, and the transverse impression moves farther forward.

Life-cycle. The imago has been met with from May to October and again in February, hibernating in moss (Guérin and Péneau), and I have found the larva in its last instar in August.

Habitat, etc. It inhabits marshy places, and is specially characteristic of the Fen District, where it is found by sweeping herbage at ditch-sides, etc. W. E. Sharp records it from the Sweet Gale at Hatchmere, Cheshire (Whittaker, 1), and I have found it in some numbers at the roots of the same plant in the New Forest. Péneau took it in France on conifers in May. This would probably be a haven of rest during hibernation. Schilling found it at the roots of *Verbascum*, and J. Sahlberg gives *Carices* and *Cyperaceae.*

Distribution. It is found chiefly in Central Europe, and is very restricted in its distribution in Britain. There are records from eight counties only, viz. Norfolk, Suffolk, Cambs, Surrey, Sussex, Hants, Cheshire, and Cumberland. It is fairly common in the New Forest, as well as in the Cambridgeshire Fens. There is no record from either Wales, Scotland, or Ireland, notwithstanding the abundance of likely spots. This insect and the next are our only representatives of a section of the sub-family of which twenty-seven Palaearctic members have been described, and which reaches an extraordinarily rich development in Central America and the West Indies.

85. **Pamera lurida** Hahn.

Hahn. Ic. Mon. Cim., i, 18 (1826) ; Saund., H.H.B.I. 82 (1892).

No information is available about the early stages of this species.

Life-cycle. It has been taken on the Continent from June to August and in Britain in September.

Habitat, etc. It lives in *Sphagnum*, but is a rare species. J. Sahlberg gives also *Carices*.

Distribution. It is found chiefly in Central Europe, though it extends as far north as 63°. In the United Kingdom it has occurred in two localities only, at Chobham in Surrey, and in the New Forest, where it was first taken. It is rare also on the Continent.

86. **Rhyparochromus antennatus** Schill.

Schill. Beitr., 76, 18, t. 8, fig. 10 (1829) ; D. & S., B.H. 206 (1865) ; Saund., H.H.B.I. 85 (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Rather elongate ; head, pronotum, and wing-pads shining black ; abdomen pale greenish-pink, tinged with fuscous at the apex ; underside entirely pale, except margins of thoracic segments and head, which are black ; legs entirely pale ; antennae, first joint black at base, pale at apex, second pale testaceous, third and fourth black ; head convex, triangular ; pronotum quadrate, very narrowly margined, pilose behind ; wing-pads pilose, broadly margined, and often with a reddish patch on disc; anterior femora much thickened, with a strong spine beneath; tibiae setose.

Life-cycle. On one occasion I found both a larva and an imago on the same roadside bank in August. Leaving the larva in the hope of capturing it when matured, as I could not venture on keeping it in captivity in the immature condition, not knowing in the least what to feed it upon, I visited the same spot again ten days afterwards. This time there was no larva, but an imago showed itself, probably the same specimen, although, of course, it might have been a mere coincidence and I could not be sure. The imago has also been taken in May (G. Lewis) and on the Continent from April to October. Thus it would appear that the end of June and throughout July would be the usual time for the larval life, maturation taking place in August, and the imago ultimately hibernating.

Habitat, etc. This is not a common insect. I have found it in small numbers at the roots of herbage on a small wayside bank in Surrey. There was a considerable variety of herbage on the bank, but all the plants were such as grew but a few inches high. I visited the same bank five years later, and found the species still there. This, taken in conjunction with the observation recorded above under the heading "life-cycle," shows that the insect does not wander far, at least so long as it can find sustenance. Possibly this may have something to do with its infrequent occurrence. It is apparently carnivorous, for when I enclosed one with a nymph of *Sehirus biguttatus*, taken from the same bank, it jumped upon the *Sehirus*, and tried, though I believe without success, to plunge its rostrum into the thorax of its prey. I have found one specimen in the midst of a number of *R. dilatatus*, but there was nothing to show on what terms it was present. It has also occurred in moss and at the roots of grass-tufts. Linnell once took it by sweeping; this is probably unusual, as, like the rest of the genus, it is distinctly a ground insect. Péneau found it in France under bark in April, and this confirms hibernation in the imago condition. Schilling found it under dead leaves in July and August; J. Sahlberg gives *Calluna*.

In this genus we have a great development of the anterior femora, with consequent increase of muscular power, and at the same time the presence of one or more strong teeth on the lower edge of the femora; such an arrangement is strongly suggestive of predaceous habits, and with this the above observation tallies. This insect is pterygo-dimorphous, but macroptery very rarely occurs. It sometimes exhibits an oligomery of the antennae which is of the same character as that described in detail under *Scolopostethus affinis*.

Distribution. In Europe *R. antennatus* inhabits chiefly the centre and the north, extending even a little distance within the Arctic Circle, and reaching eastwards as far as Turkestan. In Britain it has been found only south of the Thames, in the counties of Kent, Surrey, Sussex, Devon, and Cornwall, and in the Isle of Wight.

87. **Rhyparochromus praetextatus** H.S.

H.S. Nom. Ent., i, 45 (1835); D. & S., B.H. 205 (1865); Saund., H.H.B.I. 86 (1892).

Ova. One egg taken from the body of a ♀ is a short and broad yellow cylinder slightly truncated anteriorly and with a few minute prominences at that end.

Larvae. Unknown.

Life-cycle. The imago has been found from March to September, but there is nothing to show the course of development.

Habitat, etc. This is distinctly a sand-hills insect, and hence is local in its distribution, though plentiful where it occurs. It lives at the roots of plants, such as *Erodium*, and is often found more or less buried in the loose sand. Only very occasionally is it taken by sweeping, so that apparently it seldom leaves the ground. Guérin and Péneau found it under mosses in Brittany. It sometimes exhibits the same kind of oligomery in the antennae as is described in detail under *Scolopostethus affinis*.

Distribution. It inhabits the greater part of Central Europe, together with the southern shores of the Mediterranean. In Britain it occurs in suitable localities in all the coast counties from Norfolk to Cornwall, with the exception of Hants, and in the counties of Carmarthen and Glamorgan, S. Wales; there is also a doubtful record from Yorks. Apparently, however, it is far from common in Norfolk and Suffolk. It is found also in Alderney and Jersey. There is a specimen in the Power Collection labelled "Weybridge," but it is difficult to avoid doubting whether the locality label is rightly attached, as the insect is, in all other localities, closely associated with the sea coast.

88. **Rhyparochromus dilatatus** H.S.

H.S. Wanz., vi, 33, t. 192, fig. 591 (1842); D. & S., B.H. 204 (1865); Saund., H.H.B.I. 83 (1892).

Ova. Unknown.

Larvae. Last instar; long oval, fore parts black, abdomen deep purplish-red.

Life-cycle. At Easter, 1894, I found imagines plentiful in the open in a sandy lane at Holmbury, Surrey. These must have been over-wintered specimens, brought out from their retreats by the warmth and brightness of the day. As they were abundant, it is evident that the species does not depend for its perpetuation merely upon a few over-wintered specimens, with the majority dying off in the autumn. There are records of the capture of the imago in all the months from March to September, except June, and on the Continent in November. In August I have found both imagines and larvae at Abinger Hammer, Surrey. Hence, it would appear that the eggs must be laid in early summer by over-wintered specimens, that the larvae complete their development in August, and that the adults thus produced pass the winter in retirement and come out with the sunshine of spring or early summer.

Habitat, etc. On the Easter above referred to, the insects were very active, running and flying with equal agility. They were to be found chiefly in a sandy lane leading to Holmbury Hill ; when I reached the heath at the top of the hill, I found that their numbers were considerably less. At Abinger Hammer they were amongst dead leaves at the sides of sandy pathways. Linnell mentions sandpits as a suitable locality. Parfitt took it in Devon by sweeping short herbage between woods. Its occurrence amongst dead leaves suggests the probability that the diet was an animal one, as there was no living vegetation just where the insects were found, though, of course, there is the possibility that they may be nocturnal feeders, coming out from their concealment and invading the neighbouring vegetation ; in such case, however, one would have expected them to rest at the roots of the food-plant. Guérin and Péneau give " under stones in March," and Morley found it under a stone in May.

This species also sometimes exhibits an oligomery of the antennae like that of *Scolopostethus affinis*.

Distribution. It is an inhabitant of Central and Southern Europe. In Britain it occurs in all the coast counties from Norfolk to Cornwall, as well as in Surrey, Berks, Bucks, and Glo'ster ; the only Welsh record is from Glamorgan, and there is one from Scotland, but none from Ireland. Thus its area is mainly the east coast and the country south of the Thames.

89. **Rhyparochromus chiragra** Fab.

Fab., E.S. iv, 168, 113 (1794) ; D. & S., B.H. 203 (1865) ; Saund., H.H.B.I. 84 (1892)

Ova. Unknown.

Larvae. An intermediate instar, 2 mm. Fore parts black, abdomen reddish-brown, the whole insect pilose ; head triangular, convex, eyes reddish ; pronotum quadrate, shagreened, with narrow explanate margin ; wing-pads very short ; legs yellowish-brown, femora darker, anterior femora very stout, with a sharp tooth beneath, anterior tibiae expanded at apex ; antennae four-jointed, dark brown, second joint yellowish.

Life-cycle. The imago has been taken in all the months from March to October. It matures in August, and larvae were found abundantly by Mason at Mablethorpe on July 6th, 1889. Thus its life-cycle would seem to be similar to that of the preceding species.

Habitat, etc. It is found in moss, under dead leaves, at roots of grass, and amongst vegetable rubbish generally, especially in sandy places. A favourite habitat is the short moss that grows on sandhills. Morley records it from the burrows of the water vole, and amongst river refuse, and Tuck found it taking refuge in a nest of *Bombus muscorum*. E. Saunders (23) records it as occurring abundantly on May 19th under heaps of coarse grass, etc., which had been cut down in the winter in a field at Woking, and had lain rotting on the ground there all the rest of the time. It sometimes occurs in company with *R. dilatatus*.

It has several varieties, two of which occur in Britain, viz. *nigricornis* Dougl. and *sabulicola* Thoms.

Distribution. It is found throughout the whole of Europe and in Siberia, extending within the Arctic Circle and southward to the north of Africa. With us, as on the Continent, it is the commonest and most widely distributed species of the genus ; it occurs in all the coast counties from Lincs southwards and westwards, round to Glo'ster, and is recorded also from Lancs, Bucks, Surrey, Berks, and Wilts, and from Carmarthenshire, S. Wales. But there are no records from Scotland or Ireland.

Var. *sabulicola* Thoms. This var. belongs almost entirely to sandy coasts, where it is found amongst moss, as, e.g. in the Isle of Sheppey, at Deal, and at Camber, near Rye, Sussex. Morley records finding it with its larvae under seaweed at Felixstowe in August. The imago has been taken in all the months from April to September. It therefore probably hibernates as adult. I have one specimen from an inland locality, Shalford, Surrey, and have also seen a series from Tuddenham, Suffolk.

The var. *nigricornis* Dougl. occasionally occurs and has the second antennal joint black.

90. **Tropistethus holosericeus** Scholtz.

Scholtz. Art. Ver. Sch., 19, 2 (1845) ; D. & S., B.H. 200 (1865) ; Saund., H.H.B.I. 87 (1892).

Ova. Unknown.

Larvae. Guérin and Péneau give the following description : " Elles ont une taille d'un millimètre, le ventre rouge, la tête, le pronotum, l'écusson, les rudiments de cories et une carène transverse au milieu de la base des segments de l'abdomen, d'un brun clair ; les antennes composées de trois articles épais et cylindriques ; le pronotum non sinué sur les côtés." One very striking feature in this description is the *three*-jointed antennae ; this must surely be a misprint for *four*-jointed, unless it represents oligomery in that particular specimen.

Life-cycle. The imago is found practically all the year round. There are records, either British or continental, for all the months, except December. Guérin and Péneau found larvae with imagines in an ants' nest in September. If these larvae were fully grown, oviposition in early July would probably be implied ; at any rate, the insect hibernates as imago.

Habitat, etc. This is the smallest of the British *Lygaeidae*. It is found, though not commonly, at the roots of grass, in moss, or amongst low herbage generally, in sandy and chalky places. J. Sahlberg gives the roots of *Thymus serpyllum*. The moss that grows under juniper bushes yielded it to Norman, and Parfitt found it at the roots of grass in sandy places in January. Saunders speaks of it as fairly abundant in moss on the chalky slopes behind the landslip between Seaton (Devon) and Lyme Regis. I have found it also in a disused chalk-pit on the Surrey Downs at Abinger Hammer. Here it was running about amongst the loose blocks of chalk and the moss and other plants that had grown up between them. Dr. Puton says that in Corsica it occurs in ants' nests, without, however, mentioning the species, and Guérin and Péneau also found both larvae and imagines in a similar position in Brittany, but again there is no mention of the species of ant. There is, however, no record of such an occurrence in Britain. Mr. Donisthorpe has not met with it in the very numerous ants' nests of all kinds that he has investigated.

It has several varieties which are found in the south of Europe.

Distribution. Of very general occurrence on the Continent and extending into Algeria, its records for Britain are confined to six counties, viz. Surrey, Berks, Hants (I. of Wight), Bucks, Dorset, and Devon. Its area, therefore, lies almost entirely south of the Thames, and Surrey appears to be its headquarters.

91. **Ischnocoris angustulus** Boh.

Boh. Vet. Akad. Förh., 56, 10 (1852); D. & S., B.H. 209 (1865) (Hypnophilus hemipterus); Saund., H.H.B.I. 87 (1892).

Of the early stages of this species I have no information.

Life-cycle. As with the preceding species, there are records of the capture of the imago in almost all the months of the year, the only exception being January, but there is nothing to show the course of the life-cycle. Of course, the insect hibernates as imago.

Habitat, etc. This insect is pterygo-dimorphous, but the macropterous form is rare. It usually occurs with the brachypterous, but Saunders (23) once found a number of macropterous examples together, unmixed with brachypterous. He says: "This little bug is rarely seen with the elytra and wings developed; in fact, I am not sure that there is any record of its occurrence in this country in that condition; I was, therefore, much surprised to take several on the 19th May, with the membrane fully expanded and belonging to both sexes, under heaps of coarse grass, etc., which had evidently been cut down in the autumn and had lain rotting on the ground all the winter in a field just opposite my house. It seems to me a curious locality for the species to frequent, as it has generally occurred to me at the roots of the heather, etc., and Douglas and Scott also give its locality as "'in moss among heath,' and although everyone knows the heathy nature of Woking, yet there is no actual heath within a quarter of a mile of the spot in question. The insect was rare, but all the specimens I found were macropterous, and I could see no signs of the ordinary micropterous form. After I had searched this locality, which yielded me, besides the *Ischnocoris*, a profusion of specimens of other common *Rhyparochromidae*, I went on to a heathy spot, where I at once found a specimen of *I. angustulus*, micropterous as I should have expected. It therefore seems to me probable that this colony of macropterous examples may have been the result of eggs laid in a locality more favourable for development than the heath which the insect most generally frequents."

As hinted above, this insect frequents heaths, where it is found running on the ground in the spaces between the heath plants. It has also occurred at the roots of grass (Linnell), and on the Continent on the banks of a lake. Fieber gives " under *Artemisia campestris* and *Sedum acre*."

Distribution. The area of *I. angustulus* is Europe in general, and Algeria. In some parts of the Palaearctic Province it is accompanied by, and in others its place is taken by, closely allied species. In Britain it has been recorded from the coast counties from Norfolk to Cornwall, except Essex, and also from Bucks, Surrey, and Berks. It has been found also at Aviemore, Scotland, but there are no records for Wales or Ireland.

92. **Macrodema micropterum** Curt.

Curt. B.E., xiii, 612, 2 (1836); D. & S., B.H. 208 (1865); Saund., H.H.B.I. 88 (1892).

Ova. Unknown.

Larvae. Last instar, 3 mm. Fore parts shining black, abdomen, antennae, legs, and underside dark brownish-black; head alutaceous, pronotum finely wrinkled and alutaceous in places; abdomen very finely alutaceous, almost transversely striate; head triangular; pronotum trapezoidal, very slightly wider behind, anterior angles rounded, sides narrowly margined; tarsi two-jointed, antennae four-jointed, with projecting hairs, last joint largest; anterior tibiae expanded at apex, intermediate and posterior with a few strong setae on inner edge.

From the above it will be seen that at the last moult the pronotum becomes considerably broadened in front.

Life-cycle. The insect matures at the end of July or the beginning of August, and the imago has been found in all the months from February to October; thus the insect evidently winters as imago. I have taken nymphs in August.

Habitat, etc. This is another inhabitant of heaths, occurring in exactly the same way as the preceding species. It has also been found in moss in sandy places; Guérin and Péneau report it in Brittany from meadows in August, and Fieber (2) under juniper. Like *Ischnocoris* it is pterygo-dimorphous, but the macropterous form is decidedly rare. I have taken several in Sussex and Surrey (Butler, 9), and Douglas took it at Bournemouth in September. It sometimes shows an oligomery of the antennae in the same way as *Scolopostethus affinis.*

Distribution. It inhabits the greater part of Europe, extending as far north as 67° 10′; in Britain it has been recorded from all the coast counties from Yorks to Cornwall, except Essex and Dorset, as well as from Surrey, Derby, Cheshire, and Cumberland. There is a record also from Scotland, but none from Ireland or from Wales.

93. **Pionosomus varius** Wolff.

Wolff. Ic. Cim., 148, t. 15, fig. 142 (1804); D. & S., B.H. 195 (1865); Saund., H.H.B.I. 89 (1892).

There is no information about the early stages of this insect.

Life-cycle. The imago has occurred with us in June, and on the Continent from July to September. I have also taken it commonly in Jersey in April. Hence, it probably hibernates as imago.

Habitat, etc. It occurs on the ground and is exceedingly active; its rapid movements and bright markings render it much more conspicuous than would be imagined from its very small size (Walker, 2). This I can confirm from my experience in Jersey. Guérin and Péneau record it in Brittany from meadows in August and sand-dunes in September. According to Schilling it occurs at the roots of *Hieracium pilosellum*, *Gnaphalium arenarium*, *Thymus serpyllum*, and other plants. Snellen van Vollenhoven found it at the roots of *Jasione montana*. English observers have associated it chiefly with *Erodium*. (Walker, 4.)

Distribution. This is one of our rarest *Lygaeidae*. All the known British specimens came from between Sandwich and Deal, where it was originally taken by Curtis. The exact spot is on the sandhills near the Coastguard Station, about two miles west of Sandwich, and the latest captures here were made by Mr. A. Piffard in June, 1890, and by Commander Walker in 1898. Piffard says: "The area to which it seemed to me to be limited was a cart track leading down to the beach, about one hundred yards north of the Fort, skirting a part of the sandhills, enclosed and used as golf-links by the St. George's Club; the notice to trespassers will serve as a guide, for the dozen specimens I obtained were all taken within one hundred yards of that. The cart track is overgrown with stonecrop and *Erodium*, under the shelter of which the insect was running about singly and not abundantly." Walker found it about half a mile from this spot. Marshall also saw the species at Swanage, but did not capture any. It is curious that this little insect should be so rare with us, as it is quite common on the opposite side of the Channel and also in Jersey. It is distributed through practically the whole of Europe and extends into Siberia and Turkestan.

94. **Plinthisus brevipennis** Latr.

Latr. Gen. in., 123 (1807); D. & S., B.H. 211 (1865); Saund., H.H.B.I. 90 (1892).

No information is available about the early stages of this species.

Life-cycle. The imago has been taken from March to October and in December. Guérin and Péneau say that it occurs in winter under moss. Morley (4) records macropterous examples in June and September.

Habitat, etc. This, again, is a pterygo-dimorphic species, the macropterous form being the *bidentulus* of Herrich Schaeffer. This form is rare, but is occasionally found in some numbers in certain spots, as though they resulted from the same batch of eggs (cf. *Ischnocoris angustulus*).

This is our solitary representative of a rather large genus, which contains some thirty Palaearctic species, bearing a close resemblance to one another. Almost all the others are southern in their distribution and are therefore not likely to occur with us. *P. brevipennis* is an inhabitant of sandy places, both littoral sandhills, and inland spots such as sandpits. In such localities it may be found in the open, or under dead leaves, or at the roots of low plants. Morley (4) found a macropterous specimen on oak at Staverton Thicks, Suffolk, in June. This is a most unusual occurrence and seems to suggest that the insect had taken advantage of its wings to fly there from some neighbouring sandy spot. It occasionally shows an oligomery of the antennae like that of *Scolopostethus affinis*.

Distribution. It is very widely distributed, occurring throughout the greater part of Europe, as well as in the north of Africa and in Turkestan. In Britain it occurs in all the coast counties from Norfolk to Cornwall and the Scilly Is., as well as in Surrey, Berks, Bucks, Wilts, Glo'ster, Cheshire, the Isle of Wight, and Glamorgan, S. Wales, but it is not recorded from either Scotland or Ireland. Thus its most northerly recorded limits are in Norfolk and Cheshire.

95. **Lasiosomus enervis** H.S.

H.S. Wanz. Ins., vi, 37, 618 (1839); Saund., H.H.B.I. 91 (1892).

Nothing is known of the early stages of this insect.

Life-cycle. Commander Walker took the imago in February, 1899; Mr. Billups (1) in March, 1881; Mr. T. Edmonds in May; Mr. Chitty in the summer of 1901; Mr. H. R. P. Collett on July 6th, 1922; Mr. Morley (4) in July, 1897; and Mr. Bedwell in September, 1912. These dates provide a fair record for the year, without, however, revealing when oviposition takes place. The larvae would probably be found between May and July.

Habitat, etc. Superficially this insect resembles *Stygnocoris pedestris*, and it may possibly have been passed over by collectors for this reason. It may be recognised by its rather larger size and its shining appearance. It is a ground insect and should be looked for at the roots of low plants, etc., in sandy or chalky places. Walker's specimen was found amongst dead leaves, Billups' amongst moss, while Morley's and Collett's occurred by sweeping. Almost all the captures have been of single examples, but on September 25th, 1912, Bedwell took sixteen specimens at the roots of coarse grass in a very restricted space on Culver Cliff, I.W., and could have taken more but for his being misled by its resemblance to *Stygnocoris pedestris ;* J. W. Brown has a specimen from Sandown, I.W.

Distribution. This is a rare species, and besides our own country has been found in Central and Southern Europe, Turkestan, and Egypt. In Britain it is of very occasional occurrence, and has been found only in Kent, Surrey, Suffolk, the Isle of Wight, Hants, and Devon. The Kent localities are a chalky district on Darland Hill, near Chatham (Champion), and another near Doddington (Chitty) ; the Surrey locality is a sandy one at Weybridge (Billups), the Suffolk a similar one at Southwold (Morley), the Isle of Wight a chalky one at Culver Cliff (Bedwell), the Hants a bank overlooking the shore sandhills at Mudeford, near Christchurch (Collett), and the Devonian one probably sandy (Edmonds).

96. **Acompus rufipes** Wolff.

Wolff. Ic. Cim., 121, fig. 145 (1800) ; D. & S., B.H. 218 (1865) ; Saund., H.H.B.I. 92 (1892).

Ova. Eggs taken from the body of a ♀ are 1¼ mm. long, of a honey-yellow colour, cylindrical, rounded at one end and truncate at the other, with smooth shining surface.

Larvae. Last instar, 2¾ mm. Fore parts black, abdomen bright red, with three oval black bars in the area of the scent-glands ; head broadly triangular ; pronotum trapezoidal, sides rounded in front, with narrow explanate margin which is still more narrowed in front ; all the fore parts shagreened and wing-pads and scutellum transversely wrinkled ; legs yellowish-brown, femora darker ; antennae brownish-black, second joint yellowish.

Life-cycle. The imago may be found all the year round ; there are records for every month. Morley (4) records finding specimens *in cop.* in June and July. These would probably be over-wintered examples as the imago appears to mature in August.

Habitat, etc. This species is an inhabitant of marshy places, where it lives even in the wettest spots. I have found it in a marsh in the very swampy spaces lying deep down between great tussocks of tall grasses. In the Broads and Fens of Norfolk and Suffolk it is often found in profusion in flood refuse. The species is pterygo-dimorphous, but the brachypterous form is by far the commoner. In copulation the sexes go about tail-to-tail, the smaller ♂ being dragged about by his partner. The above-described larva shows oligomery in the right antenna, which has only three joints, the last two being much longer than usual, and there is no pale joint. It is very seldom that this malformation is seen in *larvae.*

Distribution. It inhabits the greater part of Europe, and extends its area southward to Algeria and eastward into Syria and Siberia. In Britain it is recorded from the coast counties from Norfolk to Cornwall, except Sussex and Devon; also from Durham, Surrey, Berks, Bucks, Glo'ster, Oxon, and Cambs. There are no records from either Wales, Scotland, or Ireland.

97. **Stygnocoris rusticus** Fall.

Fall. Mon. Cim., 70, 17 (1807); D. & S., B.H. 214 (1865); Saund., H.H.B.I. 93 (1892).

Ova. Eggs taken from the body of a ♀ are 1 mm. long, cylindrical, orange-yellow, truncated at one end and rounded at the other; rather broad in proportion to length.

Larvae. Last instar, 3 mm. Fore parts black, abdomen bright red, with three oval black bands in area of scent-glands; whole insect strongly pilose; fore parts shagreened and rather strongly punctured; head triangular; pronotum trapezoidal, sides rounded in front, with narrow explanate yellowish margins, which are still further narrowed in front; legs yellow, anterior femora darker; antennae four-jointed, basal joint black at base, yellow at apex, second and third yellow, third darker at base, fourth black, second and fourth sub-equal.

Life-cycle. The imago has been taken from March to October, except in April, but there are no indications of the course of the life-history save these two, that Snellen van Vollenhoven records examples found *in cop.* in August, and that I have received from Mr. Whittaker a larva in the last instar taken also in August. But these two records are somewhat incongruous.

Habitat, etc. This species again is pterygo-dimorphous, and the brachypterous form is the commoner, but the macropterous (=*Stethotropis incanus* Fieb.) is fairly frequent. The insect is generally taken by sweeping, as it frequents flowers. Douglas and Scott (1) record it as plentiful on *Pulicaria* in September in the Isle of Wight. It is sometimes found on the ground amongst the roots of low plants, and by beating nettles (Parfitt). I have a specimen with the right antenna oligomerous, having only three joints, but each of the last two is longer than usual, though their combined length still falls short of that of the other antenna.

This genus contains a number of closely allied species, of which *S. pygmaeus* at least may be expected to occur with us.

Distribution. *S. rusticus* inhabits practically the whole of Europe and Algeria, and is also found in N. America, though it has not yet been observed in Siberia. In the United Kingdom it is one of the most widely distributed species of the *Lygaeidae*, having been recorded from all the coast counties from Northumberland round to Glo'ster, except Durham, as well as from Cumberland, Lancs, and Cheshire in the north, from Notts, Cambs, Herts, Worcester, Hereford, Oxon in the Midlands, and from Middlesex, Surrey, Berks, and Wilts in the south. In Wales there are records from the counties of Carnarvon, Merioneth, Glamorgan, and Carmarthen, and it is included in the list of Irish Hemiptera, but hitherto it has escaped notice in Scotland.

98. **Stygnocoris pedestris** Fall.

Fall. Mon. Cim., 71, 18 (1807); D. & S., B.H. 215 (1865) (sabulosus); Saund., H.H.B.I., 94 (1892).

Ova. Unknown.

Larvae. A larva of 1¾ mm., in its penultimate instar, may be described as follows: Head triangular, eyes rather prominent; pronotum trapezoidal, very transverse, widest behind, with distinct explanate lateral margins; mesonotum rather longer, with similar lateral margins, and hind margin doubly sinuate, with traces of wing-pads; abdomen oval; fore parts reddish fuscous, abdomen bright red with yellowish connexivum; scent-glands with three dull fuscous bars, the first the deepest; the whole upper surface with rather long, scattered, yellowish pubescence, indistinct on head and longest on thorax; legs yellowish, femora and middle of tibiae slightly infuscated; antennae with four stout reddish-brown segments, their junctions yellowish; underside coloured as the upper.

Last instar, 2¼ mm. As above, but with wing-pads more fully developed.

1st instar. Fore parts brown, abdomen bright red; legs light brown; antennae light brown, four-jointed, last joint very long; length ¾ mm.

2nd instar. Fore parts reddish-brown, abdomen red with three black bars in area of scent-glands; a few scattered hairs; head convex, triangular, eyes touching pronotum, which is trapezoidal, narrowly margined; legs yellowish-brown; antennae four-jointed, brown, last joint largest, but not so large as in preceding instar. Length 1 mm.

I have not been able to discover more than the four instars above described. It will be seen that in the later instars the legs and antennae lose their dark coloration, except the last joint of the latter.

Life-cycle. The imago has been found from June to November, and again in January. (Billups, " P. Ent. Soc. Lond.," 1884, xi), and on the Continent in April. I have taken larvae in the youngest instars in June and nymphs in August, so that the insect matures in the latter month and the imago hibernates.

Habitat, etc. This is a very common species, probably one of the commonest of our Heteroptera, though seldom found in large numbers together. Unlike the preceding, it is not dimorphous, though there is a great difference in size in different individuals, and the ♂♂ are, as a rule, considerably smaller than the ♀♀. It is found on the ground in sandy places, in moss, especially in late autumn and winter, at the roots of grass and other low plants, under bushes and at the foot of mixed hedges; but it also occurs by sweeping. I once found it in Epping Forest very common by sweeping heather, when many specimens were taken *in cop.* The position then is tail-to-tail, the ♂ being ignominiously dragged after his stronger mate. But to judge from some observations of Capt. Xambeu, as recorded in "Ann. Soc. Lin. Lyon," 1904, the first position in copulation is with the ♂ on the back of the ♀ as usual. As soon as junction is effected he descends from this position and thus becomes tail-to-tail with his mate.

It suffers from the defect called oligomery of the antennae after the manner of *Scolopostethus affinis*. But I have also a curious specimen which varies by excess; it has the terminal (i.e. fourth) joint of the right antenna duplicated, the two segments being both placed at the end of the third joint and at a small angle with one another. This is from S.E. Durham, and was kindly sent me by Dr. J. Harrison.

Distribution. *S. pedestris* inhabits the greater part of Europe, as well as Algeria and Syria, passes into Siberia, and is found as far north as 65°. It is also very generally distributed in the British Isles, even more so than the preceding species, being recorded from twenty-eight English counties, viz. all except Salop, Staffs, Derby, Leicester, Rutland, Cambs, Hunts, Beds, Northants, Warwick, Monmouth, and Dorset; from four Welsh counties, Carnarvon, Brecknock, Glamorgan, and Carmarthen; from both Scotland and Ireland, and from the Isle of Man.

99. **Stygnocoris fuligineus** Geoffr.

Geoffr. in Fourc. Ent. Par., 205 (1785); D. &. S., B.H. 216 (1865) (arenarius); Saund., H.H.B.I. 94 (1892) (arenarius).

Ova. Length about $\frac{3}{4}$ mm. Reddish-yellow, tubular, nearly straight, rounded at posterior end, truncated at anterior, the truncation being slightly oblique. This is as taken from the body of a ♀.

Larvae. A larva $1\frac{3}{4}$ mm. long from the sandhills of Carmarthenshire is as follows: Penultimate instar; head broadly triangular; pronotum very transverse, trapezoidal, widest behind, and with narrow explanate lateral margins; mesonotum doubly sinuate behind, showing traces of wing-pads and with explanate lateral margins; abdomen oval; fore parts fuscous, shagreened or rugose and punctured, and clothed with silvery pubescence; abdomen deep ferruginous red, with shorter golden pubescence, scent-glands with three black bars; antennae stout, fusco-ferruginous with base and apex of first three joints narrowly bright red; legs brown; underside coloured as upper.

Nymph, 2 mm. As above, but with wing-pads larger, apices of femora yellow, and antennae brown.

The larvae of this species can be distinguished from those of the preceding by their duller colour.

Life-cycle. The imago may be found all the year round, and there are records for every month. The larva in penultimate instar described above was found at the end of March, and I believe larvae may also be found maturing in August. If this be so it would seem that the insect is either double-brooded or that it may be produced at irregular intervals; with the latter supposition the occurrence of the imago in every month would best agree.

Habitat, etc. It is equally common with the preceding, and occurs quite similarly under dead leaves, or running about on the ground, or found in moss, in sandy places, including sandpits, and also by sweeping. Saunders (23) records it as occurring abundantly on 19th May under heaps of coarse grass, etc., which had been cut down in the preceding autumn and had lain rotting on the ground all the winter in a field at Woking. Bold (1) found it on *Aster* on December 4th, 1865, on the coast opposite St. Mary's Island, Northumberland.

Distribution. Of quite general distribution in Europe and occurring also on the north coast of Africa and in Syria, Turkestan, Siberia, and the Canaries; it is probably equally widely distributed in the British Isles. It is recorded from twenty-six English counties, including all those on the east and south coasts, and also from Cumberland, Lancs, Cheshire, Notts, Cambs, Hunts, Beds, Oxon, Glo'ster, Bucks, Herts, Surrey, and Berks, from the counties of Carnarvon, Glamorgan, and Carmarthen in Wales, from both Scotland and Ireland, and from the Isle of Man.

100. **Peritrechus geniculatus** Hahn.

Hahn. Wanz., i, 68, t. 10, fig. 41 (1831); D. & S., B.H. 189 (1865) (nubilus); Saund., H.H.B.I. 97 (1892).

Ova. I have no information about the ova of this common insect.

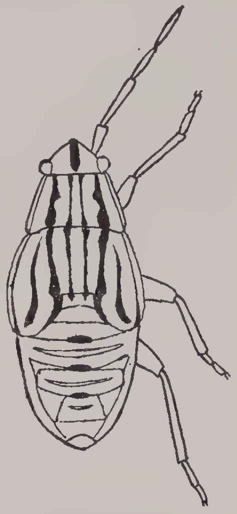
Larvae. Last instar, 4–4½ mm. Rather elongate, dull testaceous, with black longitudinal lines on the fore parts, the whole covered with a pale pubescence; one central black line on the head, four on the pronotum, the centre two close together with a very narrow yellow line between them; the foliaceous margins are separated from the disc of the pronotum by a narrow black line; the four black lines of the pronotum are continued on the scutellum, and outside these there is another on the wing-pads; the foliaceous margin also is inwardly bounded by a thin black line as in the pronotum; antennae with two basal joints piceous and the other two black; legs shining piceous, with basal tarsal joint yellowish; second and third antennal joints strongly pilose; abdomen with three black bars in centre, and each segment with brown streaks in the centre.

Preceding instar, 3¼ mm. As above, but with wing-pads not extending beyond metanotum, and tibiae paler. It will be seen that the larva is totally unlike the adult in coloration.

Life-cycle. The imago has been found from April to September and also in January (Billups), February, and November. Morley, in his Suffolk list, says "not uncommon at roots of low plants, especially in winter." Thus it passes the winter in the adult condition. The above larvae were found in August, which is evidently the month for maturation.

Habitat, etc. It is found amongst rubbish, moss, dead leaves, at roots of grass and other low plants, etc., and usually in dry places. But Saunders records it as having occurred abundantly on May 19th under heaps of coarse grass, etc., which had been cut down in the preceding autumn and had lain rotting all the winter in a field at Woking. Parfitt and Collins took it by sweeping heath. It is an active insect and shuns the light. The saw is nearly straight, and both it and the saw-case ochreous. I have a few specimens from Bexhill in which the terminal antennal joint is slightly rufous. This genus contains some very closely allied species, which do not show dimorphism.

Distribution. *P. geniculatus* is distributed over Central and Southern Europe and extends to the north of Africa and to Persia. In Britain it is recorded from the coast counties from Norfolk to Hants, and from Lancs, Glo'ster, Oxon, Bucks, Herts, Wilts, Somerset, Devon, Surrey, and Berks, and from Glamorgan in Wales, but there are no records from Scotland or Ireland. Hence its northern limit thus far is Lancashire.



Nymph of *Peritrechus geniculatus* Hahn.

101. **Peritrechus gracilicornis** Put.

Put. Pet. nouv. ent., 117 (1877); Saund., H.H.B.I. 97 (1892).

The early stages of this insect are unknown.

Life-cycle. According to Guérin and Péneau it is found all the year round in Brittany, and I have taken it in Britain in August.

Habitat, etc. In the field it might easily be passed over as *P. geniculatus*. The only British specimen concerning the capture of which details have been preserved was taken by sweeping. Guérin and Péneau record it from *Tamarix* bushes.

Distribution. It is strange that this insect, which is common and widely distributed on the Continent, should be so rare with us. It inhabits France, the Mediterranean district on both sides, and Turkestan. In Britain only two specimens have been taken; the first recorded by Douglas from Hastings and now in the Cambridge University Museum of Zoology, the second I took by sweeping on the Downs at Shide, Isle of Wight, in August, 1907. It is now in my own collection.

102. **Peritrechus nubilus** Fall.

Fall. Hem. Suec., i, 54, 10 (1829) ; Saund., H.H.B.I. 97 (1892).

Ova. Unknown.

Larvae. From some cast skins of the last larval instar, which are in my collection, the larva appears to have been more or less of a brown colour, with the usual three dark bars in the region of the scent-glands. The pronotum has narrow yellow explanate lateral margins, and on each side near the posterior angles a shallow depression filled with a silvery tomentum. The wing-pads have dark streaks. The antennae are provided with long hairs, and the rostrum appears to have reached beyond the posterior coxae. The length was probably at least 4 mm.

Life-cycle. The imago has been taken in April, and from June to October.

Habitat, etc. It occurs on the ground like *P. geniculatus*. Saunders records it from a salt marsh at the roots of maritime plants near Herne Bay, and close by the same spot I found a number of specimens in folds of a piece of tarred canvas. There were many exuviae here, showing that it had been a general place of retreat through the lifetime of the insect. Morley (4) records it from a marsh haystack at Oulton Broad, as well as at roots of marram grass on sandhills ; he also records one specimen in April from a tuft of *Aira caespitosa*, evidently an over-wintered example. Lethierry found it on the Continent under moss in spring.

It is active and avoids the light.

Distribution. This species inhabits the greater part of Europe, together with Algeria and Persia. It does not appear to be common in this country, and is recorded from coast counties only. It occurs in all the counties from Norfolk round to Hants, and in Devon, Cornwall, and Glamorgan. There are no records from Scotland or Ireland.

103. **Peritrechus sylvestris** Fabr.

Fab. Spec. Ins., ii, 368 (1781) ; Saund., H.H.B.I. 96 (1892) (luniger).

Common as this insect is, no information is available as to its early stages.

Life-cycle. The imago is found during the greater part of the year, and there are definite records for all the months except January, March, and December.

Habitat, etc. This species is much more frequently taken by sweeping than the rest of the genus. I have captured several by sweeping *Centaurea nigra*, and Parfitt by sweeping heath. But it also occurs on the ground, at the roots of various plants, in heathy places, in moss and under saline plants. I found it at the beginning of June on the Deal sandhills, and Saunders (23) took it on May 19th in heaps of coarse grass, etc., which had been cut down in the preceding autumn and had lain rotting on the ground all the winter in a field at Woking. Douglas and Scott (1) give dry and sandy places, under leaves, etc. Morley (4) records it from under the bark of aspen, sallow and ivy in winter, and McGregor from under bark in October. Guérin and Péneau describe it as occurring in moss during the winter in Brittany. According to Snellen van Vollenhoven it has been found in Holland in an orangery in October. The saw-case is dark ochreous. It occasionally shows oligomery of the antennae like that of *Scolopostethus affinis.*

Distribution. Though our commonest species of the genus, it does not appear to be so widely distributed in the Palaearctic Province as some of the others. It occurs in most parts of Europe, and in Algeria. In Britain it is widely distributed, and has been recorded from all the coast counties from Lincs to Cornwall, including the Scilly Is. (Champion, 3a), and from Northumberland, Cumberland, Lancs, Notts, Cambs, Warwick, Glo'ster, Oxon, Bucks, Middlesex, Berks, and Surrey, from Glamorgan and Pembroke in Wales, and also from Scotland, but there is no Irish record.

104. **Trapezonotus distinguendus** Flor.

Flor. Rhyn. Liv., 266, 21 (1860); D. & S., B.H. 191 (1865) (distinctus); Saund., H.H.B.I. 98 (1892).

I know nothing of the early stages of this insect.

Life-cycle. The imago has been taken in March, May, July, and August.

Habitat, etc. J. Sahlberg reports it from sandy shores under *Fucus.*

Distribution. It is a rare species found, besides Britain, only in Germany, Scandinavia, Russia, where it extends to the parallel of 65°, and Siberia. In Britain it has occurred in three counties only, Kent, Sussex, and the I. of Wight, in other words, a compact little area in the south-east.

105. **Trapezonotus arenarius** L.

Lin. F.S., 254 (1761); D. & S., B.H. 192 (1865) (agrestis); Saund., H.H.B.I. 99 (1892) (agrestis).

Ova. Unknown.

Larvae. In the last instar these are rather long-oval, entirely bronze-black, shagreened, but with a slight reddish tinge on the abdomen; legs and antennae piceous, joints of latter pinkish at extreme apex and base; two posterior pairs of tibiae strongly spined; anterior femora with a row of long hairs beneath; wing-pads transversely rugose. Length 3–3½ mm.

Life-cycle. The imago has been found from March to October. It matures in August at the latest, and apparently passes the winter in the imaginal form. I have found it in March on the sandhills of both Carmarthenshire and Sussex.

Habitat, etc. It lives on the ground, and inhabits heathy and sandy places, as well as dry places of other kinds. It is also found amongst vegetable rubbish, and at the roots of grass, especially on sandhills, and in moss during the colder weather. Reuter (19) gives an instance of its being found in October on *Juniperus communis* in Switzerland. The membrane is sometimes considerably shortened and the saw-case has the usual triangular shape and dark ochreous colour.

I have found a large and very dark var. on heathy ground at Hawley, Hants.

Distribution. It occurs throughout the greatest part of the Palaearctic Region, extending to 69′ N., and is common and widely distributed in Britain, being recorded from all the coast counties from Northumberland to Glo'ster, except Durham, and also from Cumberland, Lancs, Cheshire, Derby, Notts, Monmouth, Berks, and Surrey. The only records for Wales are from the counties of Carmarthen and Glamorgan. It is included in the lists for both Scotland and Ireland.

106. **Trapezonotus dispar** Stål.

Stål. Gen. Lyg., 56 (1872); Saund., H.H.B.I. 99 var. (1892).

As this insect, which is regarded by Saunders as a var. of *T. arenarius*, is treated in continental catalogues as a distinct species, I have given it as such here. It has a length of 5 mm. while *T. arenarius* does not reach more than 4½ mm. The colour of the rufo-ochreous area of the hemielytra is much brighter, and the black patch at apex of corium much smaller than in the allied species. The third joint of the antennae is proportionately longer, the foliaceous margin of pronotum and hemielytra rather broader and the membrane paler. There is no available information as to its early stages.

Life-cycle. The imago has been found from April to September except in June.

Habitat, etc. Similar to that of *T. arenarius.*

Distribution. It occurs in many parts of Central and Southern Europe and extends beyond the Caucasus into Syria and Turkestan. In Britain it has been recorded from Kent, Sussex, and Glo'ster; probably it occurs elsewhere, but has been included under *T. arenarius.*

107. **Trapezonotus ullrichi** Fieb.

Fieb. Beitr., 347 (1836); Saund., H.H.B.I. 99 (1892).

There is no available information as to the early stages of this insect.

Life-cycle. The imago has been found on the Continent from May to October.

Habitat, etc. Like the preceding it is found on the ground, and its only occurrence in England was on the sea-coast. Guérin and Péneau record it from the sea-coast and from oak copses in Brittany.

Distribution. It is found in Central and Southern Europe, Algeria, Asia Minor, and Turkestan. In Britain it has occurred at one spot only; the cliffs at Boscastle, Cornwall, where it was taken by the Rev. T. A. Marshall.

108. **Calyptonotus rolandri** L.

Lin. F.S., 957 (1761); D. & S., B.H. 172 (1865); Saund., H.H.B.I. 101 (1892).

Early stages unknown.

Life-cycle. The imago has occurred from May to July, and in February and September, but there is nothing to show the course of development.

Habitat, etc. It has been found under refuse in a pea-field near Darenth Wood (Douglas and Scott, 1), and De Geer says he took it on willows, adding that it is very active and flies with facility. Douglas and Scott (1) also report it as taken when flying in spring. Guérin and Péneau give the records " on bark in February and on vines in September." Reuter (19) gives " under dead leaves and stones," and also mentions that it was found in Switzerland on pines by Dubois. Wolff speaks of its being found in gardens, and Rambur " under the dead bark of trees."

A specimen I have from Bulgaria shows the orange patch much larger and paler than usual.

Distribution. It is distributed through practically the whole of Europe and extends to the Madeira and Canary Is., the north coast of Africa, and the west of Asia. It is rare in Britain, and has been recorded from five counties only, Northumberland, Kent, Dorset, Devon, where it was taken in the Cathedral Close of Exeter (Parfitt), and Cornwall. Except for the Northumbrian record it is entirely a south coast insect.

109. **Aphanus lynceus** Fabr. (subg. Graptopeltus Stål).

Fab. E.S., 722 (1775); Saund., H.H.B.I. 101 (1892).

Ova. Unknown.

Larvae. The nymph very closely resembles that of *A. pini* L., with the same coloration, and differs chiefly in size.

Life-cycle. The freshly disclosed imago is found in August and the nymph in July. But the imago has been found from April to November, and in February, so that the insect clearly hibernates in that form. Saunders (19) records it as chiefly larval in the beginning of August at Deal, 1882.

Habitat, etc. This is largely a sandhills species, although it occurs in inland sandy places as well. It has been found in moss, at roots of grasses, at the base of palings under a fir-tree in May, and on bright days it may sometimes be seen running in sandy lanes. Atmore and Collins have it from *Echium*, and this agrees with a record of Dr. Puton (3) who says that it often occurs in France on that plant. Dalla Torre took it on *Centaurea scabiosa* in May, and Péneau under moss in winter. It has been found in

November in tufts of grasses and rushes in an old sandpit at Shirley. Geoffroy says it occurs on catmint.

It is a very agile insect. Nothing is known as to its food, unless it be the *Echium* already referred to.

This is our first species of the large genus *Aphanus*, of which thirty-seven Palaearctic species are catalogued, though we possess only four.

Distribution. It is distributed throughout Europe, and in Britain is recorded from all the coast counties from Norfolk to Cornwall, except Dorset, and from Bucks, Berks, and Surrey; in Wales the only record is from Glamorgan. But it is nowhere common and does not extend into either Scotland or Ireland. Thus its northernmost limit is Norfolk.

110. **Aphanus quadratus** Fabr. (subg. Xanthochilus Stål).

Fab., E.S. supp., 541 (1798); Saund., H.H.B.I. 102 (1892).

Early stages undescribed.

Life-cycle. The imago has been taken in April and from June to October.

Habitat, etc. This insect also belongs to the sandhills. Dalla Torre took it on *Verbascum*, and Rambur gives " under the dead bark of trees." I have found it abundantly on the sandhills and sandy coasts of Jersey.

The saw-case is of the usual triangular shape and dark ochreous colour.

Distribution. Though common on the Continent generally, extending even into the Channel Is., where it is abundant, and into Algeria, Syria, and Turkestan, this species has only three records from this country, and these are from Llandudno, N. Wales, where Mr. Sidebotham took five specimens in 1867, Swanage, Dorset, where Mr. H. A. Saunders (2) captured a single specimen in July, 1910, and Slapton Ley, Devon, where Mr. Bedwell took it in 1920. Some of Sidebotham's specimens are now in the Power Collection.

111. **Aphanus alboacuminatus** Goeze.

Goeze., E.B., ii, 266 (1778); D. & S., B.H. 174 (1865) (C. pedestris); Saund., H.H.B.I. 103 (1892) (pedestris).

Ova. Unknown.

Larvae. Last instar, 5 mm. Shape similar to imago but pronotum more transverse because the part behind the impression is shorter; this part brown in centre, reddish at sides; wing-pads and abdomen reddish ochreous, darker behind; bars of scent-glands short, brownish-black; legs reddish ochreous, tibiae pitchy, anterior femora pitchy, incrassated and with a sharp spine underneath; anterior tibiae expanded at apex; there are only very minute traces of the spines that appear in the adult at the apex of intermediate and posterior femora; tarsi two-jointed, joints sub-equal except in hind pair, in which basal joint is the longer; antennae as in adult; head, pronotum and margins of abdomen clothed with scattered long hairs.

Life-cycle. There are definite records of the capture of the imago from

April to August, and again in October and November. It hibernates and is found gregariously under bark in winter ; in spring it has occurred frequently in market gardens at Ipswich (Morley, 4). There are no records of the date of oviposition.

Habitat, etc. This species occurs in various situations as, among dead leaves, on a dry sandy bank, under bark of whitethorn, black poplar, etc., Flor gives "on rotten trunks of trees," and Fieber (2) "under bark of horse-chestnut in spring." Dalla Torre says that it appears to follow the smell of carrion. It sometimes suffers oligomery of the antennae as in *Scolopostethus affinis*.

It is a very variable insect, and there is a remarkable melanic Mediterranean variety, called *funereus* Put., which is of singular beauty and quite unlike the type form in coloration ; all the parts that in the type are red or yellow have become black, and the others are white.

Distribution. *A. alboacuminatus* is found in the greater part of Europe, the Madeira and Canary Is., the north coast of Africa, and the west of Asia. In the British Isles it is recorded only from Norfolk, Suffolk, Essex, Kent, Surrey, Dorset, Devon, and Glamorgan ; thus it does not occur far from the coast.

112. **Aphanus pini** L.

Lin., F.S., 255, 956 (1761) ; D. & S., B.H. 173 (1865) ; Saund., H.H.B.I. 103 (1892).

Ova. Unknown.

Larvae. In the last instar (6½ mm.) the larva is shaped very similarly to the adult, save that the pronotum is proportionately not so broad. Chiefly dull brownish-black ; the hinder half of pronotum shows traces of the ochreous colour which appears more strongly in adult ; wing-pads more or less dark brown ; lateral margins of pronotum and wing-pads yellow and foliaceous ; two parallel ochreous lines, placed diagonally on each side of second abdominal segment, space between them red ; two ochreous spots in middle of third and fourth segments with black bars between them, showing position of scent-glands ; legs long, chiefly black ; basal half of intermediate and posterior femora ochreous ; antennae four-jointed ; basal joint and greater part of second joint reddish ochreous; second joint at apex, and third and fourth wholly black ; tarsi two-jointed ; basal joint long, especially in hind pair, in which it is more than twice the length of the terminal joint ; tibiae setose, anterior femora with a small sharp spine near apex.

Life-cycle. The imago is found from April to October, but the larvae appear to mature during August.

Habitat, etc. This is an extremely active insect, running on the ground in sandy and heathy places and under dead leaves, etc. It is also found on various plants and is taken by sweeping, both in the daytime and at evening, evidently climbing herbage. I once took a considerable number by sweeping tall grasses at Fleet, Hants. Swale records taking it in an ants' nest in Devonshire, but does not mention the species of ant (E.M.M. xxix, 262). Puton says it occurs on dry and hot soils. Reuter (19) records several instances in which it has been found on pine trees of various kinds; this would no doubt be for wintering.

It exhibits oligomery of the antennae, like *Scolopostethus affinis*. E. Saunders took one with the membrane almost colourless. The saw is almost straight and dark ochreous in colour. There is nothing to show what its food is.

Distribution. It is distributed over the greater part of the Palaearctic Province north of the Mediterranean and extending to 64° 50′, and in Britain is recorded from the coast counties from Norfolk to Cornwall, except Suffolk, from Surrey, Berks, Glo'ster, Warwick, and Salop, and from Glamorgan in S. Wales. There are no records from Scotland or Ireland. Thus its most northerly limit is Norfolk.

113. **Beosus maritimus** Scop.

Scop. Ent. Carn., 129 (1763); D. & S., B.H. 100 (1865) (luscus); Saund., H.H.B.I. 104 (1892) (luscus).

Ova. Unknown.

Larvae. Last instar, 6 mm. Elongate, with long legs and antennae; head black, vertex convex, central lobe much in advance of side-lobes, eyes not touching pronotum; pronotum trapezoidal, sides slightly sinuate, disc black with faint indication of a pale central line, anterior and posterior margins and explanate side margins widely ochreous; scutellum more or less black; wing-pads reddish ochreous with explanate side margins, abdomen ochreous with a broad central longitudinal brownish band which takes the form of a roundish patch in each segment; femora blackish-brown, anterior pair with a sharp black spine beneath; tibiae ochreous, infuscated at apex and carrying short black setae; tarsi ochreous at extreme base, elsewhere infuscated; sternum dark brown, ochreous at sides; abdomen ochreous in centre, more or less infuscated at sides; rostrum reaching anterior coxae, second joint ochreous, the rest blackish. Described from a specimen taken by Mr. Newbery, and now in my collection.

Life-cycle. I found the imagines *in cop.* tail-to-tail on June 4th, 1906, and imagines have been taken either in Britain or on the Continent from April to October, and in December. Thus it evidently passes the winter as imago.

Habitat, etc. It is an active insect, living on the ground, and is essentially a maritime species. At Deal I found a colony amongst the roots of plants close to the shore (Butler, 20). I have also met with it in Jersey in sandy places amongst the roots of plants. Marshall found it at Milford Haven cliffs, " under tufts of *Silene maritima*, on which it appears to feed; by searching the same plant on the Cornish coast," he also found a few (Saunders, 29). E. Saunders found it in Cornwall at the roots of grass, and the larvae in Whitsand Bay, where *Geotomus punctulatus* had its head-quarters. Dalla Torre found it on *Umbelliferae* and amongst dead leaves. Amyot says it occurs on old trees. Reuter (19) gives instances in which it has been found on pines.

The beautiful var. *sphragidimium* Fieb., which contains a larger development of black, especially in legs and antennae, has not been taken in Britain and is perhaps hardly likely to occur, as it is a more southern form. The saw is almost straight, and both it and its case are dark ochreous in colour.

Distribution. *B. maritimus* occurs commonly in Central and Southern Europe, on the North African coast and in Western Asia, and is abundant in the Channel Islands. In Britain it occurs chiefly in the south, being recorded from the coast counties from Essex to Cornwall, except Sussex, from Warwick, and from Glamorgan and Pembroke in S. Wales. Thus it is almost entirely a coast insect and is not found farther north than Essex. There are no records from Scotland or Ireland.

114. **Emblethis verbasci** Fabr.

Fab., S.R. 235 (1803); Saund., H.H.B.I. 105 (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Oval, ochreous with blackish markings; head triangular, eyes rather prominent, touching pronotum, central lobe broadened outwardly, extending considerably beyond side lobes, and carrying a few black bristles, side lobes very narrow at apex, vertex black, with a short central yellowish line, sutures of central lobe deep; pronotum trapezoidal, anteriorly emarginate, posterior margin straight, side margins rounded, broadly explanate; disc with two large quadrangular blackish patches, nearly meeting in middle; scutellum with an irregular blackish patch on each side, which extends slightly into the wing-pads; wing-pads longitudinally infuscate in centre and to apex; abdominal segments mottled with reddish-brown; terminal joint of antennae and of tarsi infuscate; sternum more or less black; ventral surface of abdomen mottled like the dorsal. From specimen kindly presented by Mr. K. G. Blair.

An earlier instar, 3 mm., almost identical with the above, but with shorter wing-pads, and sutures of side-lobe of face red.

An earlier instar, probably second, $1\frac{3}{4}$ mm. Head and thorax uniformly deep reddish-brown; abdomen thickly mottled with red; legs and antennae ochreous; eyes reddish; central lobe of head very broad.

Life-cycle. The imago has been found in all the months from March to October, except in May, and the insect hibernates as adult. Champion (3a) found it in the Scilly Is. in all its stages in July; oviposition therefore probably takes place at intervals.

Habitat, etc. In this insect we have one of a number of very closely allied species, and an important diagnostic feature is the length of the first joint of the posterior tarsi, which in our insect is much longer than in the allied species, being about 2½ times as long as the other two together.

It inhabits sandhills, and I have found it commonly in Jersey amongst the marram grass in such situations (Butler, 52). Guérin and Péneau record that it is found also in fields in August. Champion (3a) found it in the Scilly Is. under *Euphorbia* and *Erodium* in all its stages, running with great speed when disturbed. Douglas took it at Deal "on the tops of the hillocks among roots of grasses growing thickly under and among procumbent branches of the oldest dwarf sallows, or under bushes of *Hippophaë*, these positions being the best that could be obtained for shelter during hibernation."

In some examples the anterior part of the lateral margin of the pronotum is swollen into the form of a boss, and this is the var. *bullans* Put.

No information is forthcoming as to the food of this insect, but an allied American species, *E. arenarius* Linn., is said to be a vegetarian, feeding upon such weeds as purslane and *Chenopodiaceae.*

Distribution. *E. verbasci* inhabits the greater part of the Palaearctic Province, but though common on the Continent, it is very rare in Britain, being recorded only from Deal (Douglas) and the Scilly Is. in July, 1897 (Champion, 3a). It is common in Jersey.

115. **Eremocoris plebeius** Fall.

Fall., H.S. Cim. 59 (1807); Saund., H.H.B.I. 108 (1892).

Of the early stages there is no information.

Life-cycle. Including continental records the imago has been taken in January, from March to May, and from August to October.

Habitat, etc. It has been found in Scotland under stones lying amongst heather which grew under pine trees. Norman reports it also in January from the roots of *Calluna.*

Distribution. Occurring throughout Europe, it has been recorded in Britain only from Hants and from Scotland and S. Wales, at Forres and Taff's Well, Glamorgan respectively. These very widely separated localities certainly suggest the probabilitiy of its occurrence at some intermediate position, but at present no evidence is forthcoming.

116. **Eremocoris podagricus** Fabr.

Fab., S.R. 232 (1775); Saund., H.H.B.I. 107 (1892).

Ova. Eggs taken from the body of a ♀ are 1 mm. in length, yellow, rather broadly cylindrical, narrowed and slightly truncate anteriorly, where there are also a few minute prominences, and rounded posteriorly. The surface is smooth.

Larvae. Unknown.

Life-cycle. I found this species in some numbers on Royston Heath in May, 1901. These were probably over-wintered examples. Dr. Power's were found in April. There are continental records also which with these give a complete list from April to October.

Habitat, etc. This is a very active insect. It occurred at Royston, as above, amongst dead leaves and rubbish consisting of bits of stick, flint stones, small fragments of chalk, empty snail shells, and fragments of the exoskeleton of woodlice, at the foot of a hedge bordering the Heath. I have also found it in a similar position at Juniper Hill, Shere, Surrey. Dr. Power's original specimens from Littlington were found under like conditions, and Jennings (7) records the species from under stones and the dead leaves that accumulate under bushes, especially junipers. He also took a pair running in the sun on a road.

Distribution. *E. podagricus* is distributed throughout Europe, and in Britain has occurred in six counties only, which form three isolated areas, viz. Cambs and Herts, Kent and Surrey, Devon and Cornwall.

117. **Eremocoris fenestratus** H.S.

H.S. Wanz., iv, 95, t. 140, fig. 437 (1839); D. & S., B.H. 177 (1865) (erraticus); Saund., H.H.B.I. 107 (1892).

There are no descriptions of the **Ova** or **Larvae** of this insect, although Dr. Buchanan White found the larvae in Scotland.

Life-cycle. The imago has been found, including continental records, from May to September.

Habitat, etc. At Reigate and the neighbouring Downs it was found under and on junipers, and at Croydon amongst stones and dead leaves under bushes, especially junipers, on chalky slopes. Dalla Torre speaks of its occurring on *Heracleum sphondylium.*

Dr. Buchanan White (2) has the following remarks on this species: "I have found this bug, though rarely, upon both juniper and pine; and believing it to be entirely confined to these two plants, it was with some astonishment that I saw it living in small companies below stones on the bare and treeless summit of Mòr Shròn, and far away from either juniper or pine. At first I thought that the mountain insect might be a different species from the pine one, but I found that it is identical; and till my visit to Ben MacDhui, I could not understand how the *Eremocoris* came to be found under such different circumstances. After seeing, however, the great number of insects displayed in the 'wreck-charts'[1] of that mountain, I have begun to think that we have here an instance of involuntary migration which has resulted in the establishment of a colony of insects with habits modified to suit their changed circumstances. Thus, instead of being dwellers in the valley, they have become dwellers on the mountains; instead of inhabiting trees and bushes, they live under stones, and instead of deriving their sustenance from species of Coniferae, they feed upon (I think) *Empetrum* or *Calluna*. That the insects in question are not, like the Ben MacDhui specimens, recent emigrants, is sufficiently shown, I think, by the fact that all stages—larvae, pupae, and perfect insects—are to be found under the stones on Mòr Shròn, and that they are not voluntary migrants is probable from the circumstance that in the interval between the pine-woods and the summit of the mountains, no specimens have been found. Under such a mode of life the occurrence of some variation would not have been wonderful; but, as I said before, the mountain insect and the pine one appear to be absolutely identical."

---

[1] Snowdrifts, etc.

Distribution. *E. fenestratus* occurs chiefly in parts of Central and Southern Europe; it is found, however, also in Algeria and Turkestan. In Britain it is rare, being recorded only from Norfolk, Kent, Surrey, and Devon, and from Scotland as above.

118. **Drymus pilipes** Fieb.

Fieb. Eur. Hem., 179, 1 (1861) D. & S., B.H. 199 (1865); Saund., H.H.B.I. 116 (1892).

Of the **Ova** and **Larvae** there is no information.

Life-cycle. The imago has been found in spring and from August to October.

Habitat, etc. With this insect we enter upon a genus of closely allied insects, containing fifteen Palaearctic species, the exact relations of which to one another can hardly be regarded as quite settled. In springtime *D. pilipes* occurs in moss (Douglas and Scott); Jennings (7) records it from amongst dead leaves, and it has been found on a willow tree. It sometimes shows oligomery of the antennae, like *Scolopostethus affinis*.

I have received from Mr. E. C. Bedwell the larva of a species of *Mermis*, a parasitic nematoid worm, which was voided by a specimen of *D. pilipes* which he took at Box Hill. Unfortunately, as the worm was only in its larval condition, its exact species could not be determined. Worms of this group are very long and narrow, and this specimen is, at least, three or four times as long as its host.

Distribution. It occurs chiefly in Western and Southern Europe. In Britain it is rare, being recorded from three counties only, viz. Surrey (Billups), Berks (Collins), and Devon (Parfitt).

119. **Drymus latus** D. & S. (D. confusus Horv. Osh. Cat.).

D. & S., E.M.M., viii, 25; E.M.M., xl, 275.

Ova. Unknown.

Larvae. Last instar, 5 mm. Clothed with long hairs; brownish, with apex of wing-pads darker; pronotum shiny, alutaceous in parts; lateral margins foliaceous, rounded in front, sinuate in middle; abdomen very finely and closely punctate; antennae stout, dark, with long hairs; legs hairy, especially the tibiae; anterior femora incrassate; anterior tibiae inwardly expanded at apex. Eyes with a few outstanding hairs.

Life-cycle. In a colony I found at Warbarrow Bay, Dorset, the insects were just maturing in the middle of August.

Habitat, etc. The above specimens were found on a fallen chalk-cliff, which had become overgrown with vegetation. They were under the leaves of *Nepeta glechoma*, which was growing luxuriantly on the chalk in the damper and more sheltered parts. Collins has taken it in a marshy spot at Tubney, and also amongst rubbish on a river bank.

According to E. Saunders, who possessed the type of *D. latus* D. & S., that species is identical with Horváth's *D. confusus*, and not, as Oshanin gives, with *D. pilicornis* M. & R., and the former name, therefore, having the priority, must be used for the species. The differences between the two species *D. pilicornis* M. & R. and *D. latus* D. & S. appear in the following table:—

D. pilicornis M. & R.	*D. latus* D. & S. (*confusus* Horv.).
(i) Length, 3–3½ mm.	(i) Length, 4½–5½ mm.
(ii) Anterior tibiae of ♂ much curved, gradually dilated inwardly at apex.	(ii) Anterior tibiae of ♂ nearly straight, widely and abruptly dilated inwardly at apex.
(iii) Anterior femora with one large and five or six minute teeth.	(iii) Anterior femora with one large and two or three minute teeth.
(iv) Membrane often abbreviated.	(iv) Membrane fully developed.
(v) Abdomen beneath shiny and quite smooth.	(v) Abdomen beneath shiny, but with fine scattered wrinkles, like ripple-marks.
(vi) Basal ventral segments of abdomen with a few scattered, but distinct long hairs.	(vi) Basal ventral segments of abdomen glabrous.
(vii) Apical margin of fourth abdominal segment without fringe of hairs.	(vii) Apical margin of fourth abdominal segment with a narrow fringe of golden hairs (Butler, 19).

Distribution. This species is rare on the Continent, having been taken only in Central Europe and the Caucasus. In Britain it has occurred in eight counties, Suffolk, Glo'ster, Oxon, Kent, Surrey, Sussex, Berks and Dorset.

120. **Drymus pilicornis** M. & R.

Muls. Opus. ent., i, 118 (1852); Saund., H.H.B.I. 116 (1892).

Ova and **Larvae** unknown.

Life-cycle. The imago has been found in February and from August to October.

Habitat, etc. I have found it in August amongst moss in a chalk-pit on the Downs near Gomshall, Surrey, and also similarly on the Chiltern Hills in Bucks, near Wendover. Reuter (19) mentions a specimen found by Reiber in Alsace on *Pinus*, probably there for wintering.

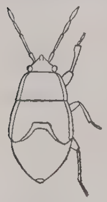
Distribution. This species, though rare, is apparently more widely distributed than the preceding. It is found in Central and Southern Europe and the Caucasus. In Britain it is recorded from Cambs, Glo'ster, Oxon, Bucks, Berks, Surrey, Sussex, and Kent. Its chief area, therefore, is in the south-east of England.

121. **Drymus sylvaticus** Fab.

Fab., E.S., iv, 163, 98 (1794); D. & S., B.H. 196 (1865); Saund., H.H.B.I. 113 (1892).

Ova. Notwithstanding (or perhaps, because of) the great abundance of this insect, I can find no record of its ova, or oviposition, nor of the youngest larvae.

Larvae. The larva in its last instar is pale ochreous, so that the distinctive coloration is not acquired till the last moult. Length, 3 mm; head convex, triangular; pronotum transverse, trapezoidal, rounded in front, with narrow explanate margins, and a transverse impression behind the middle; wing-pads reaching to nearly the middle of the body, with rather broad explanate margins; anterior femora thickened, anterior tibiae broadened and furrowed at apex; antennae black, with basal joint sometimes a little paler, fourth joint a little longer than third, second a little longer than fourth. Earlier instar, 2 mm. Very similar, but with much shorter wing-pads.



Nymph of *Drymus sylvaticus* F.

Life-cycle. The imago can be found all the year round; I have records for every month. The insects of the year mature in August, but at the same time I have taken larvae in various instars in that month, so that probably oviposition takes place at intervals during the summer.

Habitat, etc. It lives amongst dead leaves, at roots of grass, in moss and amongst vegetable rubbish generally; in fact, it is difficult to name any kind of locality in which the insect may not be met with. According to Blathwayt it is sometimes found under bark in winter. Dalla Torre found it under *Verbascum*. What, with such a habitat, its food may be, is very problematical. Oligomery of the antennae, as in *Scolopostethus affinis*, is sometimes present. The var. *ryei* D. & S. (=v. *picinus* Rey. Osh. Cat.) is regarded by Flor as the brachypterous form of *D. sylvaticus*, having abbreviated wings and an abbreviated membrane. Douglas and Scott, however, say that they have not always found this var. to have the wings abbreviated. This var. can be recognised by its darker colour, the different puncturation of scutellum, and the abbreviation of the membrane, when that occurs. The shape of the pronotum also sometimes seems to be intermediate between that of *D. sylvaticus* and *D. brunneus*.

Distribution. An exceedingly common species, distributed over the greater part of the Palaearctic Province, extending as far north as 64° 50′, and included in almost all lists for England (thirty-two counties); I have it from the counties of Carnarvon and Carmarthen, and Hallett from Glamorgan, and it is probably as generally distributed in Wales as in England. It is found also in Scotland and Ireland, but appears to be rare in the former. The only English counties for which there are at present no records are Westmorland, Staffs, Derby, Salop, Rutland, Hunts, Northants, and Monmouth. It is an unsolved problem why this species should be so exceedingly common and so very widely distributed, while the three preceding are so rare. It is evidently, for some reason or other, a very hardy insect, able to endure the winter cold and all the uncertainties of the British climate. The var. *ryei* has been recorded from Cumberland, Yorks, Lincs, Glo'ster, Oxon, Herts, Middlesex, Kent, Surrey, Hants, Wilts, Somerset, and Devon, also from Glamorgan in Wales, but not from Scotland or Ireland.

122. **Drymus brunneus** Sahlb.

Sahlb. Geo. Fen., 57, 6 (1848); D. & S., B.H. 198 (1865); Saund., H.H.B.I., 116 (1892).

Ova. Unknown.

Larvae. 1st or 2nd instar, length 1½ mm. Ovate, widest in middle of abdomen; head and thorax brown; abdomen red, with three short brown bars at the scent-glands, the first double; anus brown; eyes red; antennae four-jointed, brown, paler at junctions of segments, last joint longest and stoutest; legs pale ochreous, more or less infuscated, especially the first pair; tarsi two-jointed; abdomen alutaceous in parts; fore parts with scattered yellowish hairs; underside coloured as above; rostrum extending to posterior coxae.

Later instar, 2 mm. Similar to above, but darker; pronotum transverse, rounded in front and with foliaceous side-margins.

Later instar, 2½–3 mm. Similar to above, but with fore parts still darker, and second joint of antennae and apex of first joint pale; thorax finely rugose; mesonotum bisinuate behind, with traces of wing-pads; second joint of tarsi infuscated.

Last instar, 4 mm. Coloured very similarly to *D. sylvaticus*, but to be distinguished by thinner antennae with longer and thinner second joint, and slightly sinuate sides of pronotum.

Life-cycle. The imago is found practically all the year round. I have records for all the months except December and January. Larvae are found from June to August.

Habitat, etc. It frequents damp places, where it is found amongst dead leaves and vegetable rubbish, and also in *Sphagnum* and mosses. Reuter (19) speaks of a specimen he found in November on *Pinus excelsa*, there probably for wintering. Like the preceding, it is dimorphous, the brachypterous form being the one almost always found; this has the membrane shortened and rounded, and the wings somewhat abbreviated. E. Saunders (56) took the macropterous form (♂ and ♀) by sweeping in a damp place on Esher Common in August, 1892. Of their difference from the ordinary form he speaks as follows: "The shape of the pronotum is quite different from that of the ordinary form, being much widened towards the base and only slightly constricted across the middle, whereas, in ordinary specimens there is a deep contraction in the middle, the sides converging from the anterior dilatation towards it, and then diverging to the basal angles, the width of the base being scarcely if at all greater than that of the widest portion of the pronotum in front of the constriction. These Esher specimens are macropterous."

Distribution. *D. brunneus* is distributed throughout Northern and Central Europe, and in Siberia and extends northwards to 68° 40′. As regards England, it is contained in almost all the published lists (twenty-six counties); I have it from the counties of Carnarvon and Carmarthen, and Hallett from Glamorgan, and like *D. sylvaticus*, it is probably generally distributed in Wales; it occurs also in Scotland and Ireland, and, in fact, is almost as widely distributed as *D. sylvaticus*, though probably not so plentiful, or perhaps it would be more correct to say that it is more local, and this no doubt results from its partiality for damp places. Amongst English counties it has not yet been recorded from Westmorland, Staffs, Salop, Rutland, Lincs, Cambs, Hunts, Beds, Northants, Worcester, Hereford, Monmouth, Herts, and Somerset.

123. **Drymus piceus** Flor.

Flor. Rhyn. Liv., 251, 12 (1860); Saund., H.H.B.I. 117 (1892).

Ova. Unknown.

Larvae. Last instar, $3\frac{3}{4}$ mm. Rather parallel-sided, ochreous with fore parts and antennae brownish, last joint of latter pale at apex; region of scent-glands with three pairs of dark, curved bars; head triangular, pronotum trapezoidal, transverse, lateral margins of pronotum and wing-pads foliaceous; antennae four-jointed, comparatively slender, hairy, second joint longest; femora hairy beneath, anterior pair with one sharp spine near apex; tibiae setose inwardly, apex of anterior pair slightly expanded inwardly; tarsi two-jointed, basal joint of hind pair longest; fore parts clothed with a few short yellowish hairs.

Life-cycle. The insect matures in August as a rule, and the imago has been found from June to October, but there are no records for other parts of the year.

Habitat, etc. This insect was introduced to the English list by Douglas and Scott under the name of *Lamproplax sharpi*. It frequents wet places, and I have taken it in *Sphagnum* at Burnham Beeches, and in damp moss at Savernake Forest. It is also found at roots of rushes, under vegetable rubbish, etc. E. Saunders and I have taken it in some numbers under cut water plants at Gracious Pond, on Chobham Heath; Champion found it amongst heaps of cut grass at Chippenham; and I have taken it by sweeping in a bog in the New Forest on a very hot day in August. It is a far more fragile and delicate insect than the other members of the genus, and hence frequently suffers the loss of legs and antennal joints.

Distribution. *D. piceus* is not common, either on the Continent or in this country. It appears to be entirely a northern species, being recorded from France, Scandinavia, N. Russia, and Siberia, but it does not extend farther north than 60° 40′. In England it is widely distributed, though very local; it has been recorded from the following counties, Northumberland, Cumberland, Durham, Yorks, Notts, Norfolk, Cambs, Bucks, Essex, Kent, Surrey, Hants, Wilts, Dorset, and in Wales from Carnarvon and Glamorgan. It was also taken by Dr. Sharp at Dalton Loch, near Thornhill, Dumfries. There is no record from Ireland, notwithstanding the abundance of suitable localities there.

124. **Notochilus limbatus** Fieb. (Taphropeltus id. Osh.).

Fieb. Var., Z.B. Ges. Wien, 257 (1870); Saund., H.H.B.I. 113 (1892).

Ova and **Larvae** unknown.

Life-cycle. The imago has been found on the Continent in March and April, and in Britain in May, July, and September.

Habitat, etc. It frequents damp places, such as the banks of streams, etc. Donisthorpe, Walker, and Bedwell have found it in *Sphagnum* in the New Forest. Lethierry took it in a wood near a sandpit, by sifting moss, under which were several nests of three species of ants, *Ponera contracta*, *Myrmecina graminicola* (latreillei), and *Formica rufa*, and he once obtained several examples in the interior of the nests of the last mentioned (Douglas, "Ent. Mo. Mag. xi, 266"). Guérin and Péneau record it from moss and on heather in spring.

Distribution. This species is rare everywhere. On the Continent it is recorded only from France and Spain, while in Britain it has been found only at Southsea, Hants, in the New Forest, in Bewdley Forest, Worcestershire, and, most unlikely of all, in Bowes Park, a northern suburb of London, where Bedwell took a specimen in wet moss in a ditch. The Power Collection contains a specimen without locality.

125. **Notochilus contractus** H.S. (Taphropeltus id. Osh. Cat.).

H.S. Nom. Ent., i, 45 (1835) ; D. & S., B.H. 186 (1865) ; Saund., H.H.B.I. 113 (1892).

Ova. An egg taken from the body of a ♀ is of a narrow oval shape, slightly truncated at one end ; colour orange-yellow ; length about ⅔ mm.

Larvae. The larvae are prettily variegated.

Life-cycle. The imago has been found from January to September, but there is no evidence of the course of development.

Habitat, etc. It occurs at the roots of plants, such as *Chenopodiaceae*, *Artemisia*, etc., amongst dead leaves and vegetable rubbish, and in moss. It may be obtained also by sweeping amongst nettles, and I have found it in a chalk-pit. It frequently suffers from oligomery of the antennae in the same way as *Scolopostethus affinis*. Notwithstanding the frequency with which I have come across this species, I have never yet seen it feeding. Probably this is done at night, and in that case the above habitats might be mere retreats for shelter ; certainly in them there is not much suggestion of anything very appropriate as food.

Distribution. A very common species throughout the greater part of Central and Southern Europe ; it extends also into Algeria and Syria. It is included in almost all English lists, thus, all the coast counties from Norfolk to Cornwall and also Northumberland, Durham, Lancs, Cheshire, Notts, Cambs, Warwick, Glo'ster, Hereford, Oxon, Bucks, Herts, Surrey, Berks, and Wilts ; from Carmarthen and Glamorgan in Wales, and from Scotland, but there is no record from Ireland.

126. **Notochilus hamulatus** Thom. (Taphropeltus id. Osh. Cat.).

Thoms. Op. ent., i, 200 (1870) ; E.M.M., xliv, 252.

This insect, the *N. obscurior* of Rey, closely resembles the preceding. The following is Rey's description : " Corps ovale oblong, rétréci en avant, subdéprimé, subrugueusement ponctué, presque glabre, d'un noir presque mat avec la base des élytres un peu moins foncée. Tête triangulaire, moins large que le bord antérieur du pronotum, convexe, densément et rugueusement ponctuée, d'un noir peu brillant. Bec d'un testacé de poix. Yeux saillants, subglobuleux, d'un roux brun. Antennes atteignant environ le milieu des élytres, finement pubescentes, entièrement noires. Pronotum transverse rétréci en avant, à peine moins large en arrière que les élytres, subéchancelé au sommet, plus largement au devant de l'écusson ; peu convexe ; subsinué sur le milieu de ses côtés ; sillonné en travers et également en long de manière à former une croix ; densément et rugueusement ponctué ; d'un noir peu brillant avec les rebords latéraux pâles à l'endroit des sinus et cette couleur plus rétréci en approchant du sommet. Écusson grand, densément et rugueusement ponctué ; offrant sur son disque un chevron surélevé à pointe prolongée en arrière jusqu'au sommet en forme de carène. Élytres subdéprimées, d'un noir très mat et presque imponctué dans leurs deux tiers postèrieurs ; parées à leur base d'une grande tache nébuleuse, peu tranchée, d'un roux brunâtre, occupant toute l'endocorie, la base de la mésocorie et de l'exocorie ; celle-ci offrant vers son dernier tiers une tache rousse, peu distincte, ne touchant pas au bord latéral ; la mésocorie sérialement ponctuée à sa base, le clavus dans toute sa longueur. Membrane plus ou moins enfumée avec une tache pâle derrière le sommet des exocories. Dessous du corps noir. Poitrine rugueusement ponctuée. Ventre convexe, très éparsement pubescent ; brillant, presque lisse. Pieds d'un roux testacé parfois assez foncé, avec les cuisses noires, moins les genoux. Tibias antérieurs assez fortement recourbis en dedans." It may be distinguished from *N. contractus* by its smaller size, its rather shorter and therefore thicker-looking antennae, its shorter pronotum, which is less widened posteriorly and rather more closely and more rugosely punctured, its transverse impression rather less strongly marked. The elytra are rather darker, especially at the base, and the spot near the apex is reduced to a minimum ; the corium also is less punctured.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in August.

Habitat, etc. Its habitat is no doubt similar to that of preceding, e.g. the late W. West found it in rubbish.

Distribution. This species is recorded from Europe and the Caucasus. In Britain it has only recently been recognised as distinct from *N. contractus*, and only a few specimens are at present known. W. West took one at Lewisham ; Champion had two labelled "London district," one of which passed into the Saunders Collection now at Oxford ; J. Edwards records it from Glo'ster rather commonly, and I have two, one from the Capron Collection and taken probably in Surrey, the other without locality, taken by myself.

127. **Scolopostethus pictus** Schill.

Schill. Beitr., 79, 22, t. 7, fig. 1 (1829) ; D. & S., B.H. 182 (1865) ; Saund., H.H.B.I. 111 (1892).

Ova. Eggs taken from the body of a ♀ are yellow, broadly and shortly cylindrical, rounded at one end and truncated at the other.

Larvae. Last instar, 4 mm. Rather elongate ; head triangular, pronotum transverse, rounded in front, foliaceous at sides, straight behind, foliaceous margins slightly projecting in a point, wing-pads about half as long again as pronotum, abdomen widest in middle ; colour reddish-brown, margins of pronotum yellowish ; scutellum reddish-brown, wing-pads testaceous, reddish-brown at apex and extreme base ; abdomen with three transversely oval dull black patches enclosing the openings of the scent-glands, a testaceous band running across the abdomen from the ends of the first of these ; legs testaceous, femora castaneous except at base and apex ; antennae four-jointed, long and slender, testaceous with third joint and bases of first and fourth piceous ; tarsi two-jointed, basal joint longer than terminal, the latter brownish.

Life-cycle. The imago has been found in February and also from April to September inclusive. The above larvae were taken in August.

Habitat, etc. This insect I have always found in stacks, sometimes in considerable numbers. They seem to prefer stacks of the coarser kinds, straw, beans, clover, etc., and may be beaten either from the thatch or from the sides of the stack. Péneau records it as found in France on willows in July. They are active insects, running with great agility. The superior size, bright colours, and macropterous condition of this insect enable it to be easily recognised and distinguished from the commoner species. It is the largest of our representatives of the genus, and in analytical tables is usually set down as distinguished by the rufescent antennae ; too much reliance must not, however, be placed upon this feature as there is a good deal of variation in the colour of these organs. The form in which the two last antennal joints are black is the var. *antennalis* Horv. It sometimes exhibits oligomery of the antennae in the same way as *Scolop. affinis*.

Collins found this species in rotting clover at the bottom of a stack, and this was evidently the breeding place, as larvae occurred as well. I have found the larvae also in the thatch of stacks. Dalla Torre found it on *Umbelliferae* and amongst grass. Puton says that in France it often occurs in ants' nests. In Finland it is found under rejectamenta such as rotting *Phragmites* and *Fucus*.

Distribution. Though distributed throughout the Continent up to 63° and in Asia Minor and Syria, it is very local in Britain, having been recorded only from the counties of Norfolk, Cambs, Oxon, Berks, Herts, Surrey, Sussex, Hants, Dorset, and Devon. It seems to be associated chiefly with a chalky soil. Although so local, it is nevertheless common where it occurs. Its northern limit is Norfolk, and there are no records from either Wales, Scotland, or Ireland.

128. **Scolopostethus grandis** Horv.

Horv. Term. Füz., iv, 1880 ; Saund., H.H.B.I. 111 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken from April to September.

Habitat, etc. The habitat of this insect is entirely different from that of the preceding ; it occurs on the ground amongst dead leaves and at the foot of hedges. I have found it also on several occasions amongst dry dead leaves in the immediate neighbourhood of a nest of *Formica rufa* in Epping Forest.

This nest has, unfortunately, now disappeared, and with it the bug. It is usually not fully macropterous, but has the membrane rather abbreviated. No use has yet been suggested for the tubercles on the mesosternum in this and the next species.

Distribution. There are but few records of this insect from the Continent, and hitherto it has been found only in France, Hungary, and Bosnia. The British records also are not numerous, and only seven English counties are known as its home, Cumberland, Notts, Essex, Kent, Surrey, Sussex, and Devon. The only Welsh one is from Glamorgan, and there are no Scottish or Irish ones. Not improbably, however, it occurs elsewhere, as it might easily be passed over as one of the commoner species. The habitat, however, is somewhat different.

129. **Scolopostethus affinis** Schill.

Schill. Beitr., 80, 25 (1829); D. & S., B.H. 183 (1865) (adjunctus); Saund., H.H.B.I. 111 (1892).

Ova. Unknown.

Larvae. Last instar, 2½ mm. The shape of the body is similar to that of *S. pictus*, but with shorter abdomen. Head and anterior two-thirds of pronotum, scutellum and extreme base of wing-pads dark castaneous; posterior third of pronotum and the greater part of the wing-pads testaceous, two spots on the former, and an angular fascia at the apex of each of the latter, castaneous; abdomen reddish-brown, with the usual three oval black marks on the scent-glands; the pale fascia which is continuous with the basal one of these is intersected by two parallel lines, one dark castaneous and the other red; there is also a red patch between the second and third; connexivum spotted; antennae with two terminal joints and base of first piceous or black, remainder of first and whole of second testaceous; legs testaceous with femora and base of posterior tibiae more or less piceous; anterior femora spined, but I see no trace of sternal tubercles.

Life-cycle. The imago is evidently to be met with all the year round. There are records for every month in the year except November. It appears to mature in August.

Habitat, etc. This species lives chiefly on nettles, though it is not confined to them. Mason records it from moss and roots of grass, and Linnell also from the latter; J. Sahlberg adds *Rubus idaeus*. Sometimes it occurs running on the ground at the roots of tall herbage. I have found it thus at Corton, Suffolk. Péneau records it as found in moss in winter. It is dimorphic, and usually has the membrane much abbreviated, more so than in *grandis*. It occasionally shows oligomery of the antennae. Bold describes this irregularity thus: A joint is missing on one side only, and then the second or third joint is so much elongated that the whole antenna is nearly of the normal length. This is the usual way in which oligomery occurs, in whatever species it is found. Like the preceding, this species has the mesosternum tuberculated, and the brachypterous form is the usual one.

Distribution. Distributed throughout the Continent and in N. Africa and Siberia, *S. affinis* is contained also in all British lists, and is probably the commonest species of the genus we possess. It has been recorded from thirty counties in England, the missing ones being chiefly those for which no lists of Hemiptera exist. I have it also from the counties of Brecknock and Carmarthen in Wales, and Hallett from Glamorgan, and it is recorded from both Scotland and Ireland. The macropterous form does not extend quite so far north as the brachypterous, 62° 40′ as against 66° 10′.

130. **Scolopostethus thomsoni** Reut.

Reut. Ann., S.E. Fr., 562 (1874); Saund., H.H.B.I. 112 (1892) (neglectus).

Ova. Eggs taken from the body of a ♀ were very similar to those of *S. pictus*, but smaller, viz. yellow, broadly and shortly cylindrical, with one end rounded and the other truncated.

Larvae. Last instar, 2½–3 mm. Very similar to that of *S. affinis*, but with antennae entirely black except apex of first and base of second joints, which are testaceous, and tibiae more or less brown; there is also more of the dark colour on the wing-pads, which show only an oval spot on the clavus, and the outer part of the mesocorium testaceous; eyes red.

A younger larva, possibly of this species, 1½ mm. Head, pronotum, and basal two-thirds of mesonotum piceous; remainder of mesonotum and whole of metanotum testaceous; abdomen red; antennae piceous, except apex of first and base of second joints, which are very pale testaceous; legs brown; no wing-pads; three black bars on abdomen; tarsal joints sub-equal; eyes red.

There is great difficulty in distinguishing from one another the larvae of most species of this genus except *S. pictus*. I have done my best to sort them out, but am rather doubtful of the result.

Life-cycle. The imago has been found from March to September, and larvae in their last instar, as well as a few younger ones, are to be met with in August.

Habitat, etc. This species generally occurs by sweeping. Like the preceding, it is often found on nettles; I have it also from a marsh, where it was amongst low herbage. It is dimorphic, and in the brachypterous form, which is much the commoner, it has the membrane greatly abbreviated. The dimorphic species of this genus suffer rather frequently from oligomery in the antennae, a malformation which scarcely ever occurs in those that are macropterous only. The usual style of the oligomery is the same as that described under *S. affinis*. The habits of this and the preceding species are very similar, though they differ from one another in the presence or absence of tubercles on the mesosternum. Certainly this structural peculiarity does not seem in any way to affect their habits, in fact *S. grandis* differs more from *S. affinis* in habits, though both are tuberculated, than *S. affinis* does from *S. thomsoni*, though one is tuberculated and the other not.

Distribution. *S. thomsoni* is distributed almost throughout the Continent and in N. Africa ; in Finland it reaches 64° 20′. It also extends into the Nearctic Region, being recorded from Canada, Ohio, and California. In Britain it seems to be not so generally distributed as *S. affinis*, being recorded from twenty-three counties only in England, viz. the coast counties from Yorks to Somerset, except Essex and Dorset, and from Cumberland, Lancs, Cheshire, Notts, Leicester, Cambs, Warwick, Oxon, Bucks, Herts, Surrey, Berks, and Wilts ; in Wales the records are from Carmarthen and Glamorgan, and it is found in both Scotland and Ireland.

131. **Scolopostethus decoratus** Hahn.

Hahn. Wanz., i, 139, t. 22, fig. 71 (1831) ; D. & S., B.H. 185 (1865) (affinis) ; Saund., 112 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{1}{2}$–$2\frac{3}{4}$ mm. Almost identical with that of *S. thomsoni*, but to be distinguished by its slightly thinner antennae, which are almost entirely black.

Preceding instar, 2–$2\frac{1}{2}$ mm. Similar, but with wing-pads not reaching beyond posterior margin of mesonotum.

Life-cycle. The imago of this insect is probably to be found all the year round. There are records for all the months except November and December. The imago evidently hibernates ; it is rare in July, no doubt because the specimens of the previous year which have over-wintered are then dead, while those of the current year are still for the most part in the larval condition. Unless the hibernating specimens hide away in very inacessible quarters, the number that pass the winter must be a small fraction of those that are to be found in August and September, for very few can be found in winter in the spots where they have been most abundant in the autumn.

Habitat, etc. This species is generally associated with the common heather (*Calluna vulgaris*), under the tufts of which it often occurs in swarms. Here and on the plant it lives its whole life. But though one of the most general of heath insects it is not confined to such localities. On one occasion I found a few specimens in a marsh in Surrey, when there was no heather within a considerable distance. Again, I have found the species in several parts of Central Herefordshire, though not very commonly, and yet no heath occurs there at all, and the nearest plants must have been many miles away.

Distribution. *S. decoratus* occurs in almost all the countries of Europe and in Algeria, Egypt, Asia Minor, and Turkestan. In Britain its distribution is necessarily almost coextensive with that of the heather amongst which it usually lives ; but as the *Calluna* is of very general distribution, so also is the bug, though apparently not so general as the plant. It is recorded from twenty-two English counties, viz. all the coast counties from Durham to Cornwall, as well as Cumberland, Cheshire, Notts, Leicester, Cambs, Hereford, Oxon, Bucks, Berks, and Surrey. In Wales the records are from the counties of Carnarvon, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland. Some of the deficiencies in the English records are probably due to the lack of observers rather than to the absence of the insect. It is, however, rare in Scotland.

132. **Scolopostethus puberulus** Horv.

Horv. Rev. d'Ent., 70 (1887) ; Saund., H.H.B.I. 112 (1892).

Ova and **Larvae**. Unknown.

Life-cycle. I have taken the imago in April and in August, and Morley records a specimen at roots of heather in March, and there are further records for February and June.

Habitat, etc. With us this seems to be chiefly a coast insect, living at the roots of tall herbage at the base of cliffs. It was thus that I found it near Bexhill, Sussex, on ground that has since been washed away by the sea. E. Saunders took it at Seaton, Devon, in damp moss and at the roots of grass at the base of the chalk cliffs, and Collins reports it from a marsh. The brachypterous form is that usually met with ; I have only one of the macropterous. The brachypterous has the membrane abbreviated to about the same extent as *S. grandis*, but the pubescence of the fore parts will distinguish this species.

Distribution. This insect is much more restricted in its distribution than its congeners. On the Continent it is recorded only from Central Europe, from France across to the Carpathians. In Britain it has been found in eight English counties, Norfolk, Suffolk, Cambs, Oxon, Sussex, Berks, Somerset, and Devon. Dr. Buchanan White once found it stranded on a snowdrift on Ben MacDhui at a height of 4000 feet, and this he regarded as an instance of involuntary migration. (See also *Eremocoris fenestratus.*)

133. **Gastrodes abietis** L.

Lin., F.S. 257, 969 (1761) ; D. & S., B.H. 167 (1865) ; Saund., H.H.B.I. 119 (1892).

Ova. Unknown.

Larvae. Undescribed.

Life-cycle. The imago hibernates between the scales of fir-cones and also under bark (Reuter). Fletcher found it commonly on spruce firs in Worcestershire in the early spring of 1857, and also in March, 1880, he beat two specimens from spruces, and obtained three others from cones. I have also found it in May on a fallen spruce, and Hamm similarly found it in

April in the cones of a fallen tree. All our British records are for the winter and spring, from February to May and in December. Of continental authors, Flor gives August and September, and Reuter May, July, and August, but the insect seems to be nowhere common.

Habitat, etc. This insect is arboreal in habits, and in that respect differs from most of the *Lygaeidae.* It inhabits the spruce fir (*Abies excelsa*), on which it has been found between the scales of the cones in winter, as well as under the bark. At Pitlochry, Norman took it from cones of *Abies douglasi.* He states that the ordinary spruce firs have been beaten in vain for it in summer, but that he has found it in December in the fallen cones. In Belgium it has been found on walnut (Jennings, 6.)

Distribution. *G. abietis* is found in Northern and Central Europe and in Siberia ; in Norway it even reaches the parallel of 70° ; in Britain it has been recorded from the following ten English counties, Staffs, Norfolk, Suffolk, Worcester, Glo'ster, Oxon, Herts, Surrey, Hants, and Wilts, and Norman also found it in Scotland, at Pitlochry and Forres. But there are no records from Wales or Ireland. Its occurrence in the *cones* of the trees may perhaps have led to its having been overlooked elsewhere.

134. **Gastrodes ferrugineus** L.

Lin., S.N. ii, 730, 99, (1767) ; D. & S., B.H. 168 (1865) ; Saund., H.H.B.I. 118 (1892).

Ova. Unknown.

Larvae. The larva in its last instar, 4½–5 mm., has much the same shape as the adult, save that it is proportionately narrower in front, the pronotum is not so long, its lateral margins are less sinuate and more distinctly laminate, the eyes are not quite so prominent, and, of course, there is no puncturation. The spines on the anterior femora are not so strong, and the tarsi are, of course, two-jointed. Colour obscure red-brown, with the fore parts and scent-glands darker ; three flavous transverse bands, one, abbreviated, at the base of the pronotum, one on the metanotum, where it appears between the wing-pads, and one, curved, across the hinder part of the first and the fore part of the second abdominal segment, the suture forming a reddish line dividing this band into two ; this last band remains in the adult, although, of course, it is concealed when the wings are closed ; the pale pronotal band seems to be the indication of the ferruginous colour which marks the hinder part of the pronotum in the adult.

In the preceding instar, 3½ mm., the wing-pads do not extend beyond the end of the mesonotum ; the insect up to this point is entirely red-brown, and beyond it red, with two flavous fasciae, not very distinct, one occupying the base of the metanotum, and the other the junction of the two basal abdominal segments ; the terminal abdominal segment is blackish ; the smaller denticles on the anterior femora are very minute.

Life-cycle. The insect matures at the end of July or the beginning of August, and it retires into hibernation probably about the end of October, reappearing in the following spring, when it may be found up to June. Morley records it from beneath the bark of *Pinus sylvestris* in February; in fact, there are records for every month in the year, except March, November, and December. Date of oviposition unknown.

Habitat, etc. This species again is arboreal and inhabits the Scotch fir (*Pinus sylvestris*), from which it may be obtained by beating. Whittaker records it from larch, and in this agrees with Douglas and Scott; on the Continent also Flor obtained a specimen from that tree. Reuter gives instances of its being found on other *Coniferae*, including *Abies excelsa*, the spruce fir, and states that it winters under bark. There are also continental records of its being taken on birch and *Sorbus aucuparia*, though probably these were accidental occurrences.

Distribution. It inhabits Europe and Siberia. In Britain it is common and generally distributed, being likely to be found wherever the Scotch fir grows. It has been recorded from all the coast counties from Yorks to Glo'ster, as well as from Cumberland, Cheshire, Leicester, Hereford, Oxon, Bucks, Herts, Surrey, Berks, and Wilts. The only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland.

Family V. **PYRRHOCORIDAE**

Of this group, the so-called red-bugs, which is treated by most authors as it is here, as a separate family distinguished from the general mass of the *Lygaeidae* most easily by the absence of ocelli, we have only one British representative, and that a very rare one. The family is essentially a tropical one and contains a number of brilliant species characteristic of both the Old and New Worlds. Sixteen species are reckoned in the Palaearctic Fauna, and it is by far the commonest of these that extends its range as far as our Islands. This species is of extraordinary abundance on the Continent, and its natural history is better known than that of almost any other Hemipteron. There is something peculiar about the chitin which forms the exoskeleton of the *Pyrrhocoridae*, in that it is softer and less crisp than usual.

135. **Pyrrhocoris apterus** L.

Lin., S.N. 727, 78 (1767); D. & S., B.H. 164 (1865); Saund., H.H.B.I. 120 (1892).

Ova. Amyot and Serville, quoting from Brullé's translation of an article by Hausmann, give the following particulars: " La femelle se traine lentement çà et là, et dépose dans les lieux humides, sous les feuilles, environ vingt œufs disposés en un petit tas. Ces œufs, grands d'une demi-ligne, sont ovales, d'un blanc de perle, très-lisses et brillants. Ils acquièrent peu à peu une couleur plus bleuâtre, et groississent de plus en plus d'une manière insensible jusqu'à l'éclosion de l'insecte."

Leuckart adds the following: At the anterior end of the oval egg there are five short processes which enclose an area of about $\frac{1}{8}$ mm. broad, and appear merely as minute, thin-skinned cups, which constitute the circle of the micropyles; they are of the same height as their width at the top; their inner opening is extremely minute, but outwardly it is broadened into a funnel-shaped opening. In some rare cases, there are seven instead of five of these cups. There is no lid to the eggs of this insect; the chorion is thin in proportion to the size of the egg and without any marking.

The insect is extraordinarily prolific; I have found the body of the ♀ stuffed full with eggs, which not merely occupy the abdomen, but also crowd up as far as into the mesothorax.

Hausmann states that six or eight weeks after laying, the young bugs are hatched. But from consideration of the fact that the numbers of this species which appear year after year remain pretty constant, whereas reckoning from the above degree of multiplication, they should increase indefinitely, he reckons that probably not more than half the eggs hatch, and that even then something like 80 per cent of the individuals so produced must perish in some way before they have the opportunity of reproducing their kind.

Larvae. According to Hausmann, the young bugs are at first whitish, but soon get their colour on exposure to the air. They are of similar shape to the adult, and 2 mm. in length. Fore parts black with a red central line, except on the head, and red-bordered; abdomen red, with a round black spot above on each of the third and fifth segments, and anus black; legs black with the articulations red. On reaching a length of about 5 mm. they moult for the first time. In this second instar they are at first whitish, but after a few hours attain their red and black coloration, three black spots appearing on the underside. The next moult occurs when they are about 8 mm. long. The pronotum now loses the red central stripe and is deeply red-margined all round, and the wing-pads become longer and are blackish with a slight red tinge, and margined outwardly with reddish. Beneath, the head is reddish-black, the prosternum blackish with narrow red margins, the rest of the sternum black with the exception of two bright orange patches just outside the intermediate and posterior coxae. There is no trace on the wing-pads of the large *circular* black spots which are so characteristic of the adult; or perhaps it would be more correct to say that the black colour covers all the wing-pads, except the outer margin, and so is quadrangular instead of round; further the abdomen is red with the apex black, instead of black with the apex red, as in the adult. After reaching a length of nearly 10 mm. the larva moults for the last time.

Life-cycle. According to Hausmann, the brachypterous forms moult, as above, three times only, and the macropterous four times. Even this larger number is small in comparison with some other Heteroptera, such as the *Pentatomidae*, in which five moults are found ; and as a consequence the amount of growth in each instar is very considerable. According to Dufour, copulation takes place at the beginning of June. The full-grown larvae are found in August, and the adults occur from September onwards ; such individuals as do not fall victims to the attack of other animals live through the winter and appear again in the following spring. I have found them in immense numbers in April, both in Jersey and in Normandy. Hausmann records them as crawling about the boulevards of Göttingen even in January. Curtis records many brachypterous specimens as found paired in the middle of May on sandy banks at Beccles, Suffolk. The records are continuous from April to October.

Habitat, etc. The insect is dimorphous, the brachypterous form, which has scarcely any membrane, being much the commoner of the two. Dufour states that it is partial to *Malvaceae*, especially *Malva sylvestris*, of which it pricks the capsules, and he affirms that it does not emit any disagreeable scent. Hausmann speaks of its partiality for dead insects, and asserts that it will not attack living ones. Westwood found the species extremely abundant at Berlin in September, 1835, when they were sucking fallen berries and seeds, as well as such of their companions as had been trodden under foot. Curtis speaks of it as occurring on islands off Torquay on the tree-mallow (*Lavatera arborea*), but considers that it frequents the plant, not for its own sake, but for the aphides which prey upon it.

On the Continent it is in many places extraordinarily abundant, and the comparatively large size and the conspicuous scarlet colour of the insect cause its swarms to produce rather a startling effect upon the landscape. It is in fact so common and well-known as to have acquired a popular name, for according to Dufour it is (or was) known in the neighbourhood of Paris amongst the country people and children as *suisse*, possibly in consequence of its scarlet uniform which is suggestive of that of the celebrated " Swiss Guard " of the French throne. Its warning colours make it perfectly fearless, and it delights to expose itself on bare rocks, at the foot of walls with a southern aspect and on trunks of trees, and this even in blazing sunshine. In such positions the insects often cluster close together in batches of some fifty or sixty, sometimes climbing one over the other, and often with their heads all pointing towards a common centre.

Hausmann records again that the insects are fond of assembling on the trunks of lime trees, mounting to about four feet from the ground, and congregating on the sunny side. In consequence of this habit, the insect has acquired, in the villages near Paris, the sobriquet of *cherche-midi*. Towards winter they seek out hiding-places under stones and bark, and there remain in a torpid condition till the following spring, when they reappear and add a touch of brilliance to the landscape.

In pairing, the position ultimately taken by the insects is tail-to-tail, and the smaller male is dragged about by his mate. Copulation lasts for some three or four days, and the body of the female becomes enlarged even during this event, so that oviposition occurs very soon after the sexes have separated.

Hausmann gives an example of the extraordinary vitality of the insect ; he found in winter a specimen which had lost the whole of its abdomen, and although the damage had evidently occurred some time before, the insect was still crawling about like its uninjured comrades, and seemed indifferent to its loss.

Notwithstanding the apparently warning coloration of this insect, Hausmann speaks of it as affording food to a large number of birds, and of insects of different kinds. The absence of the usual disagreeable smell no doubt contributes to their palatability. Guérin and Péneau describe it as sucking the sap of the young shoots of lime trees, and producing swellings at the points attacked ; but no great damage is done to the trees.

According to Tullgren, this insect has three auditory hairs on each side of the centre of the second and third abdominal sternites, three before the spiracles on the fourth segment, one before and two behind the spiracles on the fifth, and two only behind the spiracles on the sixth.

Distribution. *P. apterus* is one of the most abundant species on the Continent, where it is generally distributed. It also spreads over Northern and Central Asia, and passes into the Oriental Region, and it has been recorded from Central America. In Britain it is rare, or rather very local, occurring in but few places, but occasionally in swarms where it does occur. It has been recorded from Yorks, Suffolk, Devon, Glamorgan, Carnarvon (Power), and Merioneth, and also from Lundy Island ; the Yorkshire record is from Harrogate and exists in an old MS. of 1835 (Denison Roebuck). One of the most remarkable of the Devonshire localities is an isolated rock, the Oreston Rock, at the entrance of Tor Bay. Here it was abundant in 1865, and also in 1898, an evidence of continuity for at least thirty-three years. On this spot alone in Britain does it appear to have existed in numbers comparable to those in which it occurs on the Continent ; and it is not a little remarkable that an insect which is so prolific and abundant in the Channel Islands and on the adjoining French coast should be so poorly represented on the other side of the Channel. The macropterous form does not appear to have been met with in Britain more than once, when E. C. Rye received it from Devonshire. This form is less uncommon in more southern latitudes, so that climate may have something to do with the full development of the organs of flight.

Family VI. **TINGIDAE.**

In the *Tingidae*, or Lace Bugs, we are not rich, for we have but twenty-four in our fauna, though ten times as many constitute the already known Palaearctic series, and large numbers are found also in the other Zoological Provinces. They are remarkable for the extreme delicacy of their structure and appearance, and for the extraordinary forms they assume, especially in the armature of the head and thorax. These are often covered with a hollow helmet-like expansion of the integument, and the head has frequently in addition, a number of spines or horns. The females are furnished with a sword-like ovipositor, from which it may be assumed that the eggs are inserted in the tissues of plants. The larvae also are commonly equipped with spiny projections, especially round the margins of the abdomen, but they do not show the reticulations or meshes which cover the upper surface of the adult. They are, in all probability, mainly, if not entirely, vegetable feeders, and where present in sufficient numbers may become pests to cultivated plants. None of our indigenous species seem to be of any economic importance, but a foreign species, *Leptobyrsa rhododendri* Horv., which is destructive to rhododendrons, is gradually establishing itself in gardens in the South of England. The species are all small, and only one of our British forms attains so large a size as 5 mm., most of them ranging between 2 and 4 mm., while some are even smaller. They move but slowly and are disinclined for exertion, seeming to be easily overbalanced by their widely projecting elytra. Both the sub-families are represented with us.

Sub-Family I. **Piesmina.**

This sub-family, by the exposed scutellum, the distinctly defined clavus and membrane, and the presence of ocelli, differs so much from the rest of the *Tingidae*, that it is doubtful whether they should be placed together. The group is a small one, and so far as the Palaearctic Region is concerned, contains in the latest revision by Dr. Horváth (1906), only a dozen species. Of these we have no more than two. The larvae are green.

According to Tullgren, these insects have one auditory hair only on each side of the fifth and sixth abdominal sternites.

136. **Piesma quadrata** Fieb.

Fieb. Ent. Mon., 31, 1, t. 2, figs. 7, 9, 11 (1844); D. & S., B.H. 238 (1865); Saund., H.H.B.I. 121 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{1}{4}$ to $2\frac{1}{2}$ mm. Green; oval; head similar in shape to that of the adult, but with processes of side-lobes of face not meeting in front of central lobe; pronotum very transverse, centrally carinated, and transversely rugose, much narrower in front than behind, sides slightly foliaceous, posterior angles rather distinct; scutellum centrally carinate; wing-pads and scutellum transversely rugose; surface of abdomen more or less rugose, segments very distinct; antennae similar in shape to those of the adult, but with third joint much stouter and shorter; tibiae slightly carinated; tarsi two-jointed, very similar to those of adult.

Life-cycle. The insect matures in August and the imagines may be found in that month, September and October. It occurs again in May; larvae occur in July and August.

Habitat, etc. This species occurs on the coast and in salt-marshes, on *Chenopodium* and other maritime plants. It spends its whole life on and under these plants, and when found is usually abundant. With short legs, it is necessarily slow in its movements, and the broad body easily leans to one side or other, instead of remaining horizontal. McGregor found it under stones on the banks of the Tay.

Of continental authors, Puton says that it occurs on *Atriplex*, and on *Herniaria hirsuta*, a species of *Illecebraceae* which is not native to Britain though occasionally found on cultivated ground, Perris on *Herniaria glabra*, Horváth on *Atriplex crassifolia*, *Schoberia salsa*, *Salsola kali*, and *Chenopodium*, and Gulde on *Atriplex hastata* and *A. latifolia v. salina*, and on *Aster tripolium*.

It is dimorphous, though the macropterous form is far the commoner. It varies greatly in coloration, some specimens being pale and unspotted, others show all degrees of maculation, while some are largely tinged with a dark castaneous brown. Some forms also are more or less green. The *three* pronotal carinae should be carefully noted.

Distribution. *P. quadrata* is spread over nearly the whole of Europe; on the south side of the Mediterranean it is recorded from Tunis, and it extends into Siberia and Turkestan. In Britain it has been recorded from all the coast counties from Norfolk to Cornwall, together with Durham and Cheshire, from the counties of Carnarvon, Glamorgan, and Pembroke in Wales, and from both Scotland and Ireland.

137. **Piesma maculata** Lap. (P. capitata Brit. Cat.)

Laporte, Ess. (1832); D. & S., B.H. 240 (1865) (capitatus & laportei); Saund., H.H.B.I., 122 (1892) (capitata).

This insect stands in Saunders' "Hemiptera-Heteroptera" as *P. capitata* Wolff, and in the latest British Catalogue as the same, with *laportei* Fieb. as a synonym. (According to Continental Catalogues, however, *laportei* Fieb. is a synonym of *P. maculata* Lap., and not of Wolff's species.) Douglas and Scott, in "British Hemiptera," give descriptions of two species, which they call *laportei* Fieb. and *capitata* Wolff. Saunders combines these, rejecting *laportei* as a species on the ground of the variability of certain structural points which are supposed to separate them. Altogether a dozen species of *Piesma* are described as Palaearctic, and of these *P. capitata* Wolff and *P. maculata* Lap. are the only two that have the pronotum bicarinate in front, all the rest having three carinae or more. These two species are very closely allied, and between 1804, the date of Wolff's description of *capitata*, and 1832, when Laporte described *maculata*, they seem to have been confounded. Saunders gives as reasons for the rejection of *laportei* that the foliaceous margin of the pronotum has a varying number of rows of meshes, and that the shape of the genal processes also varies. It is true that in our species the number of rows of marginal meshes does vary, but that is because the meshes themselves and their boundary lines vary in size though the foliaceous area is pretty uniform in width, and also it is rather difficult to decide how many rows there are, because there is no distinct line of demarcation, as there is in most *Tingidae* between the disc of the pronotum and its margin, but they glide into one another, as it were. The true *capitata* of Wolff, which I have from Dr. Puton, is a narrower insect with a differently shaped pronotum, narrower in front and with a narrower and less foliaceous margin. The genal processes again do vary in shape in our insect as they do in *P. maculata,* but they are long, and always curved, generally on both sides, the outer and the inner, and when, as very occasionally happens, the inner margins are straight, the outer ones are curved, so that the general effect of approximation is still produced ; whereas in the true *capitata* Wolff they are short and straight. Through the kindness of Prof. Poulton I have been able to examine the whole of the specimens in the Saunders Collection, together with those of the Chitty Collection, as well as some of Westwood's, which all stood in the Oxford Museum as *capitata* Wolff. Mr. Willoughby Ellis also has kindly submitted to me the whole of those in the Douglas Collection, forty in number, arranged as two species called *capitata* Wolff and *laportei* Fieb., though I was quite unable to trace any principle according to which they were separated. I have also upwards of sixty specimens in my own collection, and have examined very many others from other collectors. But amongst all these, numbering several hundreds altogether, I have not been able to find a single example that agrees either with what Dr. Puton sent me as *capitata* Wolff, or with what agrees with that, viz. the figure of Wolff's species in his "Icones Cimicum," whereas they all agree with the structural characteristics of *P. maculata* Lap. The only point in which our British specimens differ from the majority of continental specimens of *maculata*, is that the spots are usually less distinct ; but similarly pale specimens are to be found on the Continent as well. As the result of my investigations, therefore, I can only come to the conclusion that our insect is *P. maculata* Lap.

It seems to me most probable that Douglas and Scott never saw a specimen of the true *capitata* of Wolff, and I do not wonder that Saunders refused to make two species of our British insects ; the only thing to be regretted is that he decided in favour of the wrong species. Whether we have in this country the real *capitata* Wolff remains to be proved. There seems no reason why it should not occur, and I can only say I have never seen one. I may add that Dr. Bergroth has confirmed my conclusion from some specimens that I sent him, remarking also their pale colour.

Ova and **Larvae.** Undescribed.

Life-cycle. The imago appears in August, and I have records of its occurrence in every month of the year except December, January, and February. There can be no question, therefore, that it hibernates as an imago. Mason found it at the roots of grass in March. The spring specimens found in the open would of course be over-wintered ones.

Habitat, etc. The habits of this species are considerably different from those of the preceding; for it generally occurs by sweeping, indicating an active life higher off the ground, though sometimes it is found in moss as well and at the roots of plants. It occurs occasionally gregariously, though never, I believe, in such numbers as the preceding species. Reuter (19) says it lives in summer on *Chenopodiaceae*. I do not think it has been definitely traced in this country to any special plant. Morley records it from birch (no doubt accidental) and in grass in winter, and occasionally beneath aspen bark. On the Continent it has been found on *Picea excelsa* and larch in winter (Reuter, 19). Perhaps the most usual method of its capture is by sweeping amongst miscellaneous vegetation.

Distribution. It occurs throughout Europe, in North Africa, in Siberia, and in some parts of Central Asia. In Britain it is more widely distributed than the preceding species and has been recorded from all the coast counties from Yorks to Glo'ster, and from Salop, Notts, Warwick, Cambs, Herts, Middlesex, Surrey, Berks, Oxon, Bucks, and Wilts, and from Glamorgan, Carmarthen, and Pembroke in Wales. Thus its northernmost limit is thus far Yorks, and there are no records from either Scotland or Ireland.

Sub-Family II. **Tingidina.**

Of this very extensive group we have twenty-two species, some few of which, however, are of very infrequent occurrence. They inhabit moss, low plants, and shrubs, and except for the genera *Campylostira* and *Acalypta*, are more generally taken by sweeping and beating than by searching at roots of plants. Stones are often used as shelter, probably because they shield the insects from the sun.

The larvae, so far as they are known at present, are more or less spined on the head, often on the pronotum as well, and on the abdomen both laterally and centrally. They are brown or black, rather than green. The eggs are almost unknown, and as the ♀ has a good saw, they are evidently inserted in the stems of plants.

138. **Serenthia laeta** Fall.

Fall. Mon. Cim., 40, 13 (1807); D. & S., B.H. 242 (1865); Saund., H.H.B.I. 123 (1892).

Ova. I have a single egg of this species, which was laid on a blade of grass. It is yellow, cylindrical, rounded at one end and obliquely truncate at the other, and there are some transverse wrinkles on one side.

Larvae. Unknown.

Life-cycle. The imago has been found in all the months from March to October. Blatch (2) records it among other captures as occurring at some time or other during the first four months of the year in the Birmingham district. These records point to the hibernation of the imago. The above egg was laid in May.

Habitat, etc. This is our one solitary representative of a genus containing thirteen Palaearctic species, many of which are decidedly variable. With us, it is taken either by sweeping in grassy places, or by searching in sandy places amongst moss and other low plants. I have found it also by sweeping the plants of salt marshes at Lymington and Poole Harbour, and in a damp path in a wood in Herefordshire. Puton says it occurs on rushes and sedges, and Dufour definitely traced it to *Schoenus albus* (not a British plant) (" Ann. Soc. Ent. Fr." 1851, p. 56). Reuter records it from *Juncus.*

This species varies very much in size and in the degree of development of the membrane, as well as in the size of the meshes; in lifetime it has a beautiful bluish bloom on certain parts, but this passes away at death. Where it occurs, it is usually common and may be even abundant. Three varieties have been named, but as they occur chiefly in Eastern or Southern Europe, they are hardly likely to be found in Britain.

Distribution. *S. laeta* is found throughout Europe, and its area extends also into Siberia. In Britain its habitat extends through the coast counties from Norfolk to Dorset, and also into Lancs, Warwick, Hereford, Herts, Berks, Surrey, Wilts, and Somerset. In Wales it is recorded from the counties of Glamorgan and Carmarthen, but it has not been found in either Scotland or Ireland. Thus its northernmost limit is Lancashire.

139. **Campylostira verna** Fall.

Fall. Hem. Suec., 147, 9 (1829); D. & S., B.H. 258 & 259 (1865); Saund., H.H.B.I. 124 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been taken from March to May, and in August and September.

Habitat, etc. In this country it has usually been taken in moss and in early spring-time, but I have found it similarly in August, so that the moss is not to be regarded merely as a winter retreat but probably as a permanent residence. Puton says that on the Continent it is often taken with ants, but he does not mention the species. What exactly a liquid-feeding vegetarian insect would be doing in an ants' nest is not very clear, unless the nest should also contain living specimens of the food-plant of the bug, when the attraction would be the plant and not the ant. Kolenati says it lives on *Onosma echioides* (Horváth, 2), but this is not a British plant. Linnell found the species in a sandpit. It is a dimorphous insect, but the macropterous form is very rare; one specimen without locality is in the Power Collection in the British Museum.

This is our only species of a genus which contains sixteen Palaearctic representatives, but as almost all the others are meridional or Asiatic in distribution, it is likely to remain our solitary *Campylostira*.

Distribution. It is found over the greater part of Europe, but in Britain is not generally distributed, though sometimes common when it occurs. It is in fact recorded from eleven counties only, and six of these are south of the Thames—Kent, Surrey, Hants, Dorset, Devon, Somerset, Glo'ster, Oxon, Bucks, Herts, and Northumberland.

140. **Acalypta brunnea** Germ.

Germ. F. Ins. Eur., 18, 23 (1836); Saund., H.H.B.I. 126 (1892).

Ova. Unknown.

Larvae. These have been found in moss on oak trees (Blatch). An intermediate instar. Length 1 mm. Oval, shining yellowish, head and thorax slightly tinged with brownish; head with two central blunt spines, and a pointed one at each side; eyes reddish; pronotum transverse, anterior margin deeply emarginate; posterior margin parallel to it, but slightly triangularly produced in centre, lateral margins rounded, disc with a deeply arcuate furrow behind; meso- and metanotum short and furrowed in centre, wing-pads short and bluntly rounded; first two abdominal segments furrowed in centre, from this branch off two oblique furrows through the next three segments; last abdominal segment deeply emarginate in centre; terminal segment oval; lateral margins of abdomen very slightly indented at junctions of segments; legs yellowish; tarsi brown; antennae yellowish, black at apex; dorsal surface more or less rugose.

Life-cycle. The imago occurs in August, and has been found also in December and May; Blatch (2) found it, together with larvae, at some time during the first four months of the year. These records seem to indicate the possibility of more than one brood during the course of the year.

Habitat, etc. The genus *Acalypta* consists of moss-frequenting insects, and twenty-four of them are Palaearctic. The present species occurs in moss on rotten stumps of trees; Linnell records it from a sandpit. It is not a common species.

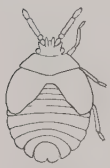
Distribution. A species of restricted distribution, being recorded only from Britain and Central Europe. In this country it has occurred in a compact area in the south, including the six counties bordering the English Channel, together with Surrey; it has also been found in Northumberland, Yorks, Salop, Warwick, and Merioneth; it is recorded also from Scotland and the north of Ireland.

141. **Acalypta cervina** Germ. (=A. carinata Pz. Osh. Cat.).

Germ. F. Ins. Eur., 18, 22 (1836); D. & S., B.H. 262 (1865); Saund., H.H.B.I. 126 (1892).

Ova. Undescribed.

Larvae. Last instar, $1\frac{3}{4}$–$2\frac{1}{4}$ mm. Oval, greyish ochreous, with margins of wing-pads fumose; head brown, with four stout diverging spines; eyes strongly granulate, facets large; pronotum transverse, deeply excavated in front, outwardly angulated behind, sides nearly straight, diverging, slightly rounded in front, centrally carinated, disc deeply excavated on each side, lateral margins faintly striated and slightly fumose; scutellum invisible; wing-pads extending to middle of body, with fumose margins broad and feebly striate; abdominal stigmata black, and situated dorsally half-way between the centre and the margin; antennae shorter and stouter than in adult, second joint globose, terminal joint black; tarsi two-jointed, basal joint very small; abdomen carinate beneath; rostrum extending to posterior coxae.



Nymph of *Acalypta cervina* Germ.

The preceding instar, $1\frac{1}{2}$ mm., differs simply in having the wing-pads much shorter, and in having in some specimens a pale line separating the connexivum from the abdomen, and the sutures of the segments of the latter pale.

Life-cycle. I have found larvae of this species in Hollington Wood, near Hastings, in February, and nymphs, probably of the same, were found in moss in November at Skellingthorpe, Lincolnshire (Marsham). I have, further, received from Mr. H. M. Hallett larvae in the last two instars, taken at Penarth, Glamorgan, in December, and also in May. And, finally, I have taken nymphs in August. The imago may be found almost throughout the year, for I have records for all months except January, April, and November. Some specimens evidently pass the winter in the larval condition, and others in the adult; this must imply more than one brood in the year.

Habitat, etc. This is another moss-frequenting species. It has also been found in a sandpit. It is not usually common, though occasionally it has occurred in some numbers.

Distribution. *A. cervina* belongs mainly to Northern and parts of Central Europe, and extends to 69° 30′. In England it has occurred in fourteen counties—Northumberland, Cumberland, Yorks, Norfolk, Warwick, Glo'ster, Kent, Surrey, Sussex, Berks, Hants, Dorset, Devon, and Cornwall; the only Welsh record is from Glamorgan, where it seems fairly common; and it is recorded from both Scotland and Ireland.

141a. **Acalypta platychila** Fieb.

Fieb. Ent. Mon., 53 (1844); E.M.M. liii, 252.

This insect bears a superficial resemblance to *A. nigrina* and *macrophthalma;* it differs in having the marginal membrane of the pronotum angulated instead of rounded in front, and composed of from three to four rows of meshes instead of two or three as in the other species. It is pterygodimorphous, the brachypterous form having the hemielytra rounded at the apex in the usual manner of *Acalypta*, and the macropterous having them elongated and so approximating to the form of a *Monanthia.* Length macr. 3–3¼ mm., brach. 2¼–2½ mm.

Ova and **Larvae.** Not described.

Life-cycle. The imago has been taken in May, July, and September.

Habitat, etc. J. Sahlberg reports that it is found amongst *Carices*, and under moss. Its macropterous form is rare.

Distribution. It is recorded from Northern and Central Europe and from Siberia. In Britain it has only once been taken, viz. by Mr. P. Harwood at Brandon, Suffolk, May 29th, 1912. Both macropterous and brachypterous forms were obtained.

142. **Acalypta nigrina** Fall.

Fall. Mon. Cim., 37, 4 (1807); Saund., H.H.B.I. 127 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from May to August.

Habitat, etc. According to Flor, it occurs on the dry borders of woods and on hills covered with low grass and heath. Assmann gives "under *Thymus serpyllum*" and J. Sahlberg "in moss." This species is dimorphous, but the macropterous form has been found only at Shapwick, Somerset, where Dale took two specimens; this form is very unlike the brachypterous, and looks more like a *Dictyonota*, save for the thinner antennae. There is often some irregularity in the rows of meshes in the sutural areas; normally there are three of these, but sometimes only two, and sometimes two in some parts and three in others. In such cases it can be distinguished from *A. macrophthalma* by the colour of the third joint of the antennae which is ferruginous, whereas in *A. macrophthalma* the antennae are entirely black.

Distribution. It occurs in Northern and Central Europe and in Italy and the Crimea. It has been observed as far north as lat. 70° in Finland. In Britain, apart from the above Somerset record and one from Oxon (Collins), it has occurred in Scotland only, in Morayshire and at Aviemore.

143. **Acalypta macrophthalma** Fieb. (=A. marginata, Wolff (1804) Osh. Cat.).

Fieb. Ent. Mon. 50 (1844); Saund. H.H.B.I. 128 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from June to August.

Habitat, etc. According to Flor, the ♂ is much commoner than the ♀, which is the reverse of what usually happens. It occurs, like the preceding species, on the dry borders of woods, and on hills covered with low grass and heath. Puton (3) says it occurs under moss, and sometimes with ants, the species of which are not given. Assmann gives the habitat as under *Artemisia campestris* (Horváth, 2). This insect is much like the preceding, but may be distinguished by its narrower form and its entirely black antennae ; the discoidal areas of the hemielytra do not extend quite so far back as in *A. nigrina*, and the sutural area has, I believe, always two very regular rows of meshes.

Distribution. It inhabits Northern and Central Europe, together with Italy, Serbia, and Bulgaria, and extends into Siberia. In Britain it is recorded only from Berks and the Cheviot District in Northumberland.

144. **Acalypta parvula** Fall.

Fall. Mon. Cim., 37, 5 (1807) ; D. & S., B.H. 263 (1865) (Orthostira obscura) ; Saund., H.H.B.I. 127 (1892).

Ova. Unknown.

Larvae. Last instar just over 1 mm. in length. Oval, entirely ochreous, with red, granulated eyes ; head with four spines, the two centre ones blunt ; pronotum transverse, excavated in front, outwardly angular behind, sides straight, diverging ; wing-pads concolorous ; terminal joint of antennae black.

Life-cycle. The imago has been found from January (Billups, 3) to October, with the exception of May. Thus the species evidently hibernates as imago. I have seen newly matured specimens in August.

Habitat, etc. This little species is found mainly in moss, both that growing on sandy ground and that found on trees (Norman), and at the roots of plants in sandy places. Dale records it on primroses, and Parfitt once found it under dry marine rejectamenta in Devon. Fieber (2) gives under *Thymus serpyllum* and *Herniaria* as the habitat. Like the rest of the genus, it is very sluggish in its movements, and its small size and insignificant appearance, together with the fact that it often feigns death, cause it to be easily passed over. Puton (3) says it often occurs with ants of the genus *Myrmica*.

It is dimorphous, and the macropterous form has the more elongate shape of a *Monanthia*. This form, though far from common, is much more frequently met with than is the case in the other species of the genus. Puton (3) describes a var. of the ♂, which is smaller and narrower than the type form and has but three rows of meshes in the lateral areas ; this is more meridional in distribution, and has not, I believe, been found in Britain.

Distribution. This is by far the commonest species of the genus, at least with us. It is recorded from all parts of Europe and from Algeria. In Britain it is very widely distributed, and is included in most county lists. There are records from the following twenty-six English counties: all the coast counties from Northumberland to Glo'ster, except Durham, and from Cumberland, Lancs, Cheshire, Notts, Leicester, Warwick, Hereford, Bucks, Herts, Berks, Surrey, and Wilts. The only Welsh records hitherto made are from the counties of Carmarthen and Glamorgan; it occurs in both Scotland and Ireland.

145. **Dictyonota tricornis** Schrk. (subg. Alcletha, Kirk. Osh. Cat.).

Schrk. Faun. Boic., ii, 67, (1801); D. & S., B.H. 255 (1865) (crassicornis); Saund., H.H.B.I. 128 (1892) (crassicornis).

Ova. Unknown.

Larvae. Last instar, $2\frac{1}{2}$ mm. Shaped similarly to adult; greyish ochreous, brown down middle of abdomen, which is shiny; head with four straight spines as in adult, two forwardly directed, two sidewards; eyes red; pronotum deeply emarginate in front, angularly projecting behind, rounded laterally; wing-pads rather long; abdominal sutures curved, penultimate deeply excavated, terminal rounded, with a longitudinal incision behind; legs concolorous with body, tarsi two-jointed, basal joint small, claws sinuate; antennae as in adult except that the hairs are very short, terminal joint black; dorsal surface of abdomen strongly and deeply punctured. Taken by Donisthorpe in Cornwall in June.

Life-cycle. The imago occurs from June to October.

Habitat, etc. Unlike most of the Tingidina, this species is usually found singly, and occurs, as a rule, by promiscuous sweeping, but I have not found it anywhere common. Curtis found the specimen upon which he erected the genus under a stone in a meadow near Bognor, Sussex; and Bedwell tells me he frequently finds it in the crevices between blocks of chalk, flint, etc., on the Downs in the Box Hill district. As food-plants Horváth (2) gives Mentha, Artemisia, and Thymus, and Carr adds broom (*Cytisus scoparius*). Dubois took it in summer by beating pine trees (Reuter, 19). Douglas and Scott (1) give "among grass and moss in dry sandy places." Morley (4) gives sandpits, nests of *Myrmica rubra*, and at roots of *Sedum acre*. Donisthorpe has found both imago and larva in nests of *A. flavus*, and J. Sahlberg gives *A. niger*.

Distribution. It is a widely distributed species, occurring throughout the whole of Europe and in Algeria. In Asia it is found in Asia Minor and Siberia, and south of that extends to Persia and Turkestan. In Britain it has been recorded from the coast counties from Norfolk to Cornwall, except Hants and Dorset, and from Cumberland, Yorks, Notts, Cambs, Herts, Glo'ster, Berks, and Surrey. The only Welsh records are from Glamorgan and Carmarthen. It is found in Ireland, but there is no record from Scotland.

146. **Dictyonota strichnocera** Fieb.

Fieb. Ent. Mon., 95, 3 (1844); D. & S., B.H., 256 (1865); Saund., H.H.B.I. 129 (1892).

Ova. Length about $\frac{3}{4}$ mm. Tubular, rounded posteriorly, slightly curved towards the anterior end, which is terminated by a distinct rounded rim, beneath which the egg is constricted. Colour brownish-yellow, with the rim and about a quarter of the length of the egg behind it pitch-black. This is the ovarian egg, five of which were obtained from the body of one ♀. The egg is large in proportion to the size of the insect.

Egg of *Dictyonota strichnocera* Fieb.

Larvae. In Epping Forest I found on July 13th, 1912, larvae just over 2 mm. in length, probably in the last instar. They are oval, dull black above, covered with minute white stellate, sessile, spine-like hairs; abdomen beneath slightly tinged with red; hinder part of head and angles of pronotum pinkish; the hairs, or perhaps one should call them spines, either tri- or quadri-radiate, the tri-radiate ones bearing a close resemblance on a smaller scale to the spicules of the sponge *Grantia;* occasional examples of quinqueradiate hairs may be seen; similar hairs, though less numerous, are found beneath, on the head, sternum, and sides of abdomen, but not on the central part of the latter; a marginal series of pale spots at the junctions of the abdominal segments; pronotum pentagonal and centrally carinated, the carina rising behind into a kind of tubercle; on the head four forward-directed spines, two close to the eyes and between them, and the other two on the front margin, the latter yellowish, with dark base; legs black, except for a broad, pale, ill-defined ring near the apex; tarsi two-jointed, basal joint exceedingly small; area of scent-glands in centre of abdomen distinguishable by being darker and less dull, and having no stellate hairs; eyes very prominent, facets large and granular; antennae very stout, third and fourth joints tuberculate, each tubercle provided with a very short adpressed seta, only to be seen with a high magnifying power; wing-pads narrow, extending to fourth abdominal segment; each segment of abdomen, except the two carrying the scent-glands, bearing a conical tubercle in the middle of its hind margin.

An earlier instar, $1\frac{1}{4}$ mm. long, is as above, except that the wing-pads are quite rudimentary, overlapping one segment only.

The stellate hairs absolutely disappear in the adult, leaving no representative; the abdominal tubercles also disappear, and one can only speculate as to their significance and their use to the larva. Whatever it may be, it must be connected with the fact that the dorsal surface of the abdomen is exposed during the whole of larval life, whereas in the adult it is covered with wings and hemielytra except when these are spread for flight. The disappearance of the ventral hairs must be due to some other considerations. The spines on the head do not disappear, but become more pronounced. The cast skin is black and so must not be thought of as a colourless transparent pellicle revealing an underlying colour, but as contributing largely to the colour of the insect.

Life-cycle. The imago may be found from June to October, but the majority of specimens appear to mature in July. I have found the sexes mated in August, and it seems likely that oviposition takes place in the autumn, the eggs not hatching, however, till late in the spring of the following year.

Habitat, etc. This species I have always found on furze, the juices of which it sucks ; to this Saunders adds broom ; where it occurs it is usually common, being, unlike the preceding species, gregarious ; occasionally it appears in the greatest profusion, as, for example, in August, 1882, when the furze bushes at Hurst Green, Sussex, swarmed with it. It has also been found in moss (Linnell). Douglas and Scott (1) also give " under moss in dry, bare places " ; this is probably a hibernating resort for such few specimens as may survive the winter, but I do not think such an event often takes place. Morley (4) swept a specimen from mullein ; this may possibly have been merely a fortuitous occurrence, not indicating a food-plant ; but it must not be forgotten that the broad leaves of *Verbascum*, especially dead ones, shelter other kinds of Tingidae.

Distribution. *D. strichnocera* is distributed throughout Central and Southern Europe. In Britain it is more widely spread than the preceding species, and has been recorded from all the coast counties from Norfolk to Cornwall inclusive, as well as from Cumberland, Yorks, Notts, Leicester, Warwick, Hereford, Glo'ster, Monmouth, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts, twenty-four English counties in all. The only Welsh records are from Carmarthen and Glamorgan, and it occurs in Scotland but is not recorded from Ireland.

147. **Dictyonota fuliginosa** Costa.

Costa, Cim. Cent., iii, 10 (1852) ; Saund., H.H.B.I. 129 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago is found from June to September.

Habitat, etc. This species occurs on old broom bushes, but is by no means common. It is best obtained by beating.

Distribution. Its continental area lies west of a line drawn from the South of France, along the South of Switzerland, and then along the boundary of Germany. In Britain it is very local, being recorded from five counties only, Norfolk, Suffolk, Essex, Kent, and Surrey, the latter being its chief home. These three species of *Dictyonota* are our only representatives of the twenty catalogued Palaearctic species.

148. **Derephysia foliacea** Fall.

Fall. Hem. Suec., 149, 12 (1829) ; D. & S., B.H. 254 (1865) ; Saund., H.H.B.I. 130 (1892).

Ova. An egg taken from the body of a ♀ is flask-shaped with a rounded collar surmounted by a trumpet-shaped head. Colour yellowish.

The **Larvae** of this exquisite little insect have hitherto eluded observation.

Life-cycle. The imago is found from June to September, but there is nothing to show the course of development.

Habitat, etc. It occurs chiefly in ivy, moss, amongst dead leaves and hedge rubbish, and may therefore be obtained both by beating and by searching at roots. W. E. Sharp found it in haystack refuse, and J. Edwards records it from ash in September. I have found it in considerable numbers in a salt marsh near Herne Bay, and Morley records it under *Chenopodium* in a salt marsh at Southwold, 16th July, 1912. Gyllenhal gives as a food-plant *Chrysanthemum leucanthemum* in dry meadows, Fieber (2) *Artemisia campestris* and *Statice armeria*, and Puton *Thymus serpyllum.* Douglas speaks of finding a specimen in his garden ten feet up a cherry tree, which for such an insect is certainly an unusual distance from the ground. In Snowdonia I found this species commonly amongst ivy growing on low stone walls. Morley (4) found one in a dead rabbit in August.

It is a rather variable species, especially in the degree of development of the hairs on the antennae and the meshes of the raised margins of the hemielytra. I have a specimen from Carmarthen which is much smaller than usual and has the antennal hairs and the thoracic keels much shorter ; also the second row of meshes of the raised margins of the hemielytra are almost unrepresented on one side and reduced in size on the other. The var. *biroi* Horv. has hitherto been found only in Hungary.

Distribution. Of general distribution on the Continent, and occurring also in Algeria, Siberia, and some parts of Western Asia, it is recorded in Britain in almost all the county lists, i.e. from twenty-nine English counties ; the omissions are Westmorland, Salop, Staffs, Derby, Leicester, Rutland, Hunts, Beds, Northants, Worcester, and Monmouth ; the Welsh counties of Carnarvon, Carmarthen, and Glamorgan ; it is found also in both Scotland and Ireland. There are several other Palaearctic species of the genus, but they are chiefly meridional.

148a. **Lasiacantha capucina** Germ.

Germ. Faun. Eur., 18, 24 (1836) ; E.M.M., lv, 203.

The genus *Lasiacantha* has the rostral channel formed by the bucculae closed in front, and has the lateral margins of pronotum and hemielytra furnished with setigerous denticles. *L. capucina* Germ. may be described as follows : Head black, with five forwardly directed straight ochreous spines ; pronotum black, with anterior vesicle, three discal carinae and raised side margins, ochreous, the latter with setigerous denticles which are often indistinct, so that it appears to be merely ciliated; hemielytra ochreous, discoidal area with 4–5 series of meshes at the widest part, costal area with two rows of meshes, the dividing lines of the outer row black, lateral margins with distinct setigerous denticles; whole of upper surface strongly pilose, hairs curved at the end; antennae with first two joints brown, tibiae and tarsi ochreous, claws black; underside black. Length, brachypt. $2\frac{1}{4}$–$2\frac{1}{2}$ mm.; macropt. $2\frac{2}{3}$–3 mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in June.

Habitat, etc. This species has for its food-plant wild thyme. Of its capture, Mr. Keys says: "The insects were taken off thyme by 'brushing' with my hand plants growing by a pathway; by this method the insects were knocked into the path and then collected; they were not abundant, at most three or four examples in a cluster of the plant." The species is dimorphous, having both macropterous and brachypterous forms, the latter of which appears to be far the commoner. The macropterous form is of the elongate shape which we are familiar with in *Monanthia*, but the brachypterous, which is the only one yet taken in Britain, has the oval outline which such a condition usually produces, and with which we are familiar in *Acalypta*. There is in the British Museum a specimen which is intermediate between these.

Distribution. It inhabits Central and Southern Europe. In Britain it has thus far occurred in one locality only, the cliffs at the Lizard, Cornwall, where it was discovered by Mr. J. H. Keys in June, 1919.

Table of Genera included Under Monanthia in British Catalogue

(10) 1. Canal from orifice of scent-gland distinct.
(5) 2. Marginal membrane of pronotum ampliated and erect.
(4) 3. Marginal membrane of pronotum not ciliated . . *Tingis.*
(3) 4. Marginal membrane of pronotum ciliated . *Lasiotropis.*
(2) 5. Marginal membrane of pronotum reflexed, not erect.
(7) 6. Marginal membrane of pronotum very narrowly reflexed *Catoplatus.*
(6) 7. Marginal membrane of pronotum broadly reflexed.
(9) 8. Reflexed membrane covering sides of disc only *Physatochila.*
(8) 9. Reflexed membrane covering almost whole of disc *Oncochila.*
(1) 10. No canal from orifice of scent-gland . . *Monanthia.*

149. **Monanthia ampliata** H. S. (Tingis id. Osh. Cat.).

H.S. Wanz., iv, 62, 397a (1839); D. & S., B.H. 252 (1865); Saund., H.H.B.I. 132 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{3}{4}$ mm. Yellowish-grey; head with five long spines, two between eyes pointing straight forward, one above and between these, also pointing forward, and two, the longest, farther back, at the sides, pointing forwards, upwards and outwards; pronotum, wing-pads, and abdomen above covered with small tubercles, each emitting a minute, erect, short spine; pronotum strongly excavate on anterior margin, irregularly serrate on lateral margins, and prolonged into the usual pointed process behind; wing-pads extending nearly half-way down abdomen; margins of abdomen indented at junctions of segments, margins of last two segments irregularly serrate; antennae rather short and stout, four-jointed, second joint almost globular, third a little longer than fourth, apical joint slightly infuscated; three strong black tubercles on abdomen, one on each of second, fifth, and sixth segments in middle line; eyes red.

Life-cycle. The imago may be found practically all the year round; I have records for all the months except January and November. Of some specimens which I found on thistles in Epping Forest on June 15th, 1912, a pair copulated on June 19th, but I did not succeed in getting any eggs.

Habitat, etc. It is generally found on thistles, and obtained by sweeping. On the Continent it is recorded from *Verbascum* (Fieber), *Cirsium* and *Carduus* (Gulde). Curtis records a specimen taken under bark. Douglas and Scott (1) give " damp places, at the roots of grass and under leaves." It often has on the abdomen a good deal of the white waxy secretion which sometimes occurs on certain species of Heteroptera, though much more commonly and abundantly on Homoptera.

Distribution. The distribution is given as Central and Southern Europe, Turkestan, and Siberia. In Britain it occurs in all the coast counties from Yorks to Glo'ster, and also in Notts, Cambs, Northants, Hereford, Oxon, Herts, Middlesex, Berks, and Surrey; the only Welsh record is from Glamorgan. It has not been met with in either Scotland or Ireland. Thus its northernmost limit with us is Yorkshire. The *M. similis* D. & S. based on two of Wollaston's captures, without special note of locality, which E. Saunders treats as a var. of *M. ampliata*, is by Horváth and Oshanin regarded as a distinct species. No other specimens have occurred, and there seems to be some doubt as to whether the specimens were even British.

150. **Monanthia cardui** L. (Tingis id. Osh. Cat.).

Lin., F.S. 920 (1761); D. & S., B.H. 281 (1865); Saund., H.H.B.I. 133 (1892).

Ova. Unknown.

Larvae. A larva, $1\frac{1}{2}$ mm. long, is oval, brown, thickly spotted with a paler colour and sparsely beset with very short erect white setae; head with two large forward-directed spines, two short ones on inner side of eyes, and a very short central one above the two first mentioned; eyes prominent, granulate, reddish; pronotum transverse, centrally carinate, emarginate in front, angulated behind, sides straight, divergent; wing-pads short, extending only to second abdominal segment; area of scent-glands reddish, unspotted; antennae stout, somewhat clavate, third and fourth joints subequal, tarsi fuscous, two-jointed, with basal joint very small.

Last instar, 2½–3 mm. Similar to above, but with much longer pronotum, which is pentagonal, and much longer wing-pads, extending to sixth abdominal segment; terminal joint of antennae and tarsi black; third antennal joint longer than fourth. The above descriptions are from the dead larvae; in life they are paler in colour and shiny. Wolff gives the following description: "Larva cinerea, capite antice bispinoso, thorace non lineato, pedibus totis pallidis." The "bispinoso" represents a superficial view, the other spines requiring close examination to detect them.

Life-cycle. The imago occurs from May to October, but it has been found hibernating in January (Billups, 3). The young of the year are produced in June and July, at a time when the thistle-heads are just ready to receive them. Buchanan White, however, says, "There appear to be two broods in the course of the summer, one in June and the other in August." It winters in moss. Norman says it occurs in Scotland almost all the year round.

Habitat, etc. This common insect lives on the heads of *Cnicus lanceolatus*, amongst the involucral scales of which it clusters. This is, I believe, the general experience of British Hemipterists; but on the Continent it is recorded as occurring on other *Carduaceae* as well, such as *Carduus nutans* and *C. acanthoides* (Fieber, 2), and also on *Marrubium vulgare* (Mayet), and *Serratula* (Amyot and Serville). Though often found in considerable numbers on a single thistle-head, it does not appear to cause any malformation of the plant. J. E. Mason (3) reports finding it in Cornwall, only in mixed hedges, and not on thistles at all. Hallett beat it off *Pinus sylvestris* or *P. austriaca* in S. Wales, where it might well have retired for wintering. The var. *cognata* Fieb. is an unspotted and possibly teneral form.

Distribution. *M. cardui* occurs throughout Europe, on the N. coast of Africa, in Siberia, and Western Asia, and in the Madeira and Canary Is. It is exceedingly common in the British Isles, being found apparently in almost all places where the food-plant occurs. It is contained in all the county lists I have seen, viz. for thirty-two counties; I have records for five Welsh counties—Carnarvon, Radnor, Brecknock, Carmarthen, and Glamorgan; it occurs also in Scotland and Ireland, though said to be rare in the latter country. According to Puton, it is much commoner in the south than in the north of France. The English counties from which there are thus far no records are Westmorland, Salop, Staffs, Derby, Rutland, Beds, Northants, and Monmouth.

151. **Monanthia angustata** H.S. (Tingis id. Osh. Cat.).

H.S. Wanz. Ins., iv, 61 (1836); Saund., H.H.B.I. 134 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in May, June, and September.

Habitat, etc. It is taken by sweeping, but no information is forthcoming as to a food-plant.

Distribution. It inhabits Central and Southern Europe and Algeria. In Britain two specimens only have been taken, one near Cisbury, Sussex, by E. Saunders, and the other at Gosfield, Essex, by A. Beaumont on May 2nd, 1903.

152. **Monanthia ciliata** Fieb. (Tingis (subg. Lasiotropis) reticulata H.S. Osh. Cat.).

Fieb. Ent. Mon. 67 (1844); D. & S., B.H. 250 (1865) (reticulata); Saund., H.H.B.I. 133 (1892).

Ova and **Larvae** unknown.

Life-cycle. The imago has been found from April to June, and from August to October.

Habitat, etc. Dr. Puton says it occurs in the flowers of *Ajuga reptans*. Fieber (2) gives under the leaves of *Verbascum thapsus* on stony hills, and under *Senecio jacobaea* in sandy places. Jennings (7) found a rather large colony at Box Hill on August 5th at a place where a few plants of *Ajuga* were growing amongst *Teucrium* and *Glechoma*. A few were actually on the *Ajuga*, but the majority were amongst thick moss at the roots of the various plants; one of the ground ivy plants appeared to have been attacked by the *Monanthia*. Edmonds found the insects hiding in May between the flowers of *Ajuga*. Morley swept one from a hedge bottom in April. Bedwell has taken it in some numbers at Box Hill on the underside of the dried-up leaves of *Verbascum*.

Distribution. It is distributed throughout Central Europe and in the Crimea and the Caucasus, but is local in Britain; it has been recorded from thirteen English counties, Yorks, Suffolk, Hunts, Essex, Kent, Surrey, Sussex, Hants, Oxon, Berks, Dorset, Devon, and Glo'ster. There are no records for either Wales, Scotland, or Ireland.

153. **Monanthia fabricii** Stål. (Catoplatus id. Osh. Cat.).

Stål. Hem. Fabr., i, 93 (1868); D. & S., B.H. 248 (1865), (costata); Saund., H.H.B.I. 134 (1892) (costata).

Ova and **Larvae** undescribed.

Life-cycle. The imago is taken from April to September, but it has been found also in January (Billups, 3). Thus the species evidently hibernates as imago.

Habitat, etc. This species is usually found in moss. Frey Gessner says it occurs on *Chrysanthemum.* Dalla Torre gives *Spartium*, *Genista*, *Hypericum.*

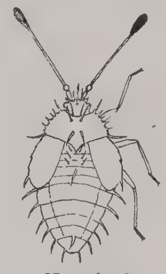
Distribution. It is found throughout Europe. Its farthest north record is from 63° N. lat. In Britain it has been recorded from the fifteen counties of Staffs, Cambs, Worcester, Oxon, Bucks, Herts, Kent, Surrey, Sussex, Hants, Berks, Dorset, Devon, Somerset, and Glo'ster; the only Welsh record is from Glamorgan, and there are none from either Scotland or Ireland.

154. **Monanthia quadrimaculata** Wolff. (Physatochila id. Osh. Cat.).

Wolff. Ic. Cim., 132, t. 13, fig. 127a, b (1804); D. & S., B.H. 247 (1865); Saund., H.H.B.I. 135 (1892).

Ova. Unknown.

Larvae. $1\frac{7}{8}$ mm. Head and thorax brownish ochreous, abdomen ochreous, darker in centre, wing-pads reddish ochreous, piceous at the extremities; head with five long forwardly directed spines, two in front, one central on disc, and two, the longest, from between and close to the eyes; pronotum pentagonal with two forwardly directed spines in front, two smaller erect spines on disc, and a number of small spines on the lateral and posterior margins, the posterior angles terminating in a strong, backwardly curved hook; three pairs of short, erect spines between the wing-pads; abdomen with four strong central, backwardly pointing spines, and a strong spine at the posterior angle of each segment; eyes red; femora reddish-brown, except apex, which is ochreous, tibiae clear yellowish, tarsi black, two-jointed, basal joint very small; antennae with two basal joints short, almost moniliform, ochreous, third very long, clear yellowish, fourth short, clavate, black. This description is taken from a specimen I found in the New Forest. I have some examples from Switzerland, evidently in the same instar, but larger ($2\frac{1}{4}$ mm.), and with all the spines much longer. This was feeding on a species of *Alnus*, while the New Forest specimen was from apple.



Nymph of *Physatochila quadrimaculata* Wolff.

Life-cycle. The larvae are found in July and August, and some remain in that condition throughout the latter month. Most specimens, however, mature in August, and the imago has been found also from July to October.

Habitat, etc. It occurs on old apple trees, and is variable in intensity of coloration. On the Continent it is found on leaves of alder; Puton (3) gives *Alnus glutinosa*, but I have found it in Switzerland on another species, apparently *A. montana;* J. Sahlberg adds *Populus tremula.* Donisthorpe has found a specimen in a nest of the ant *Acanthomyops niger.*

Distribution. It is distributed over Northern and Central Europe and extends into Siberia and Amurland. In the British Isles it is rare and recorded only from a compact little area of six adjacent counties almost entirely south of the Thames, Surrey, Hants, Dorset, Devon, Somerset, and Glo'ster.

155. **Monanthia dumetorum** H.S. (Physatochila id. Osh. Cat.).

H.S. Wanz., iv, 57, t. 124, fig. 391 (1839); D. & S., B.H. 246 (1865); Saund., H.H.B.I. 135 (1892).

Ova. Unknown.

Larvae. Last instar, 2 mm. Oval, pointed at the ends; reddish or greyish-brown, with apex of wing-pads darker; femora reddish-brown, tibiae testaceous with apex black, tarsi black; antennae with two basal joints reddish-brown, third yellow with black apex and base, fourth black; head with five spines, two in front, one on vertex, and two from behind eyes, antenniferous tubercles outwardly with a curved, blunt spine; pronotum pentagonal, with anterior margin excavated, posterior lateral angles spined, and with two pairs of spines on disc, a larger pair in front, and a smaller behind; three pairs of spines between wing-pads; four central spines on abdominal segments, each segment also ending behind in a spine at the sides, a spine also at end of wing-pads; tarsi two-jointed, first joint very small; the whole upper surface covered with minute pale stars, tri-, quadri-, and quinque-radiate; underside brown, with stars on fore parts and minute setae on hinder.

Preceding instar, 1 mm. Similar to above, but with much shorter wing-pads, and sides of abdominal segments not spined.

Life-cycle. The imago occurs from May to September, and the insects of the year mature in August.

Habitat, etc. It occurs on old whitethorns, especially those that are lichen-covered, and like the preceding species, is very variable in intensity of coloration, ranging from pale ochreous to almost black. All varieties of coloration may be found on the same tree. E. Saunders took it on a lichen-covered blackthorn. Puton (3) says it occurs on pear trees and others of the same family; Mayr gives weeping willow, and Horváth (2) also *Prunus padus* (Puton), *P. domestica* (Horváth), and *P. spinosa* (Gulde).

Distribution. Its area of distribution includes Central and Southern Europe and Egypt. In Britain it has been recorded from all the coast counties from Yorks round to Somerset, except Essex, and from Oxon, Bucks, Cambs, Herts, Surrey, Berks, and Wilts; the only Welsh record is from Glamorgan. There are no records from either Scotland or Ireland, so that its most northerly limit is Yorkshire.

156. **Monanthia simplex** H.S. (Oncochila id. Osh. Cat.).

H.S. Panz., F.G. 118, 21 (1830); D. & S., B.H. 245 (1865); Saund., H.H.B.I. 136 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from May to August.

Habitat, etc. According to Fieber (2) it occurs on *Senecio jacobaea*, and to Frey Gessner under *Euphorbia cyparissias.*

Distribution. It is distributed over the greater part of Central and Southern Europe and extends into Turkestan. In Britain it has been recorded from five counties only, and these chiefly south of the Thames, Bucks, Kent, Surrey, Hants, and Devon.

157. **Monanthia humuli** F.

Fab., E.S. 4, 77, 43 (1794); D. & S., B.H. 244 (1865); Saund., H.H.B.I. 136 (1892).

Ova. Unknown.

Larvae. Last instar, 2¼ mm. Oval, deep black, with surface shagreened and finely granulate, and covered with very short yellowish setae; head with four spines, two nearly erect, behind but between eyes, two horizontal in front, near together, a little behind the line joining the antennal tubercles; pronotum pentagonal; lateral margins with four spinous processes, two in front, two behind; feebly carinated down the centre, with four strong vertical spines, two just behind anterior margin and two in middle of disc; two similar spines on abdomen, so placed that the apex of the pentagonal pronotum passes between them; three other erect spines on abdomen placed in central line at equal distances from one another; wing-pads extending over five abdominal segments; lateral margins of abdomen furnished on each side with six long, nearly erect spines, one at apical extremity of each segment; outer margin of wing-pads also furnished with four similar but smaller spines; under surface shagreened and granulated at the sides, smooth and shining in the middle; bucculae and central channel of thorax yellowish, the latter terminating in two long yellowish spines, lying horizontally. All this apparatus of spines disappears in the imago.

An earlier instar, 1½ mm., shows everything as above, except that there are no wing-pads.

J. Sahlberg thus describes the larva: "Nigerrima valide nigro-spinosa, capite spinis 6, thoracis lateribus utrinque 6, abdominis utrinque 7, segmente tertio, et sexto medio unica rudimentisque hemielytrorum 3 minoribus armatis." It will be seen that this differs somewhat from the description I have given, especially in the number of the spines.

Life-cycle. I have records of the occurrence of the imago for all the months from February to October. I have found larvae in August and Morley in September. The insect evidently hibernates as imago, but whether one or two broods are produced in the year is not clear.

Habitat, etc. It is always found in damp places, especially the margins of ponds, where it lives on *Myosotis palustris*, and may be obtained by sweeping. According to Schumacher (7) it causes distortion in the flowers and leaves of the food-plant. Reuter found it also on *M. lingulata.* The young larvae are said by Bremi to mine in the leaves of the *Myosotis* till the first moult, but it is not easy to see how this can be accomplished, unless the little insect is as well supplied with spines as it is later on, and uses them to effect an opening in the cuticle of the leaf. According to Snellen van Vollenhoven, Ritsema found this species in March " in nesten van zangvogels."

Distribution. *M. humuli* is spread over Northern and Central Europe, but has not been found in the south, nor on the north coast of Africa; neither does it extend into Asia. In Britain it is widely distributed and common where it occurs; it is recorded from all the coast counties from Norfolk to Devon, and also from Cumberland, Staffs, Warwick, Hereford, Glo'ster, Oxon, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset; the only Welsh records are from Radnor and Glamorgan; it is recorded from Scotland (Perth), but not from Ireland.

Family VII. **ARADIDAE.**

Nearly eighty species of this family have been described as Palaearctic, most of them belonging to the genus *Aradus*. Of this large company, the British Fauna can boast of no more than five, and only two or three of these are at all common. Other Zoological Provinces also contain many additional species, and the family must be regarded as far more influential than would be imagined from British experience alone. They are mainly subcortical in habits, and thus have very flat bodies; the *Aneuri* are probably the flattest insects we possess. According to Howard, the *Aradidae* are fungivorous, in which case they would, when plentiful enough, tend to check decay in old trees.

158. **Aradus corticalis** L.

Lin., F.S. 917 (1761); D. & S., B.H. 272 (1865); Saund., H.H.B.I. 138 (1892).

Ova. Undescribed.

Larvae. Some larvae taken in the New Forest by Mr. W. G. Blatch may be described as follows: Last instar, 6 to 7 mm. Oval, entirely chestnut brown, with three rows of round black spots down each side of the dorsum of the abdomen; whole surface tuberculate; central lobe of head shorter and rounder than in adult; antenniferous tubercles with a double spine; pronotum transverse, angularly emarginate in front, sides more or less denticulate, posterior angles emarginate behind, centrally furrowed and with two semicircular depressions on disc; scutellum parallel sided, broadly rounded at apex, and centrally furrowed; this furrow is continued to the second abdominal segment; wing-pads short; lateral margins of abdomen deeply serrate; antennae four-jointed, stout, cylindrical, second joint longest, third yellowish at apex, fourth black; legs comparatively slender; tarsi two-jointed, second joint stout, claws yellow, rather strongly curved.

An earlier instar, 5 mm., is very similar to the above, but with shorter wing-pads and with second antennal joint scarcely longer than third.

Life-cycle. The imago has been found, together with nymphs, in June, and there are continental records for April, May, and July.

Habitat, etc. Blatch (3) reports finding it on a fungus-grown beech stump in the New Forest; it is found also under bark, Douglas and Scott (1) giving "under the loose bark of firs in summer," and J. Sahlberg mentions both *Pinus* and *Picea*.

Distribution. It is found chiefly in Northern and Central Europe, and its area extends into Siberia, but it is not recorded from the Mediterranean region. It is rare in Britain, having been recorded from three counties only, Kent, Hants, and Dorset.

159. **Aradus depressus** Fab.

Fab., E.S. iv, 72, 22 (1794); D. & S., B.H. 271 (1865); Saund., H.H.B.I. 139 (1892).

Ova. The egg is short oval, and at first white with a very slight greenish tinge; a circle of white prominences round the anterior end. As development of the embryo proceeds, the egg becomes deep yellowish with a number of red markings, two of which in front are the eyes of the enclosed embryo. The egg hatches by the rupture of the chorion within the circle of white prominences, and the chorion is ultimately left shining glassy white. The eggs are attached by their side and are laid separately.

Larvae. The newly hatched larva is short oval, almost parallel-sided, but widest in middle of abdomen, yellowish with red eyes, and a red patch in the abdomen, acutely pointed posteriorly and very obtusely in front; the thoracic segments more or less distinctly margined with red, especially towards the sides; legs and antennae colourless, the latter four-jointed, with fourth joint the longest. In the second instar the red parts become brown.

I found a large colony of this insect under bark on an old oak stump at Gomshall, Surrey, in August, 1900. They were packed closely together and were of all ages from quite young larvae to the adult. The youngest larvae were pale whitish ochreous; the fore parts become darker as the insect grows, till it acquires a sort of mottled appearance. The colour of the young larva varies a good deal, but there is generally a dark patch down the middle of the abdomen, and a white, more or less quadrate patch on the last few segments.

Latest instar, 3½ mm. The whole body tuberculate; head much as in the adult, but with antenniferous tubercles bifid externally, and disc with three central carinae, the middle one wedge-shaped and the side ones linear; pronotum short and very transverse, sides slightly rounded, two central carinae united in front by a cross ridge, so that the whole is horseshoe-shaped; scutellum with two parallel carinae; fore parts ochraceous tinged with reddish, and with apex of wing-pads fuscous; abdomen serrate at margins, more or less reddish ochraceous with a few large tubercles at base and on scent-glands; terminal segment of abdomen cylindrical in middle and with a spine on each side, preceding segment very deeply emarginate, and the terminal segment fitting in the emargination; legs ochreous, femora and tibiae with a dark band in the middle; antennae very stout, joints rather shorter than in adult.

An earlier instar, $2\frac{3}{4}$ mm. Very similar, but with thoracic segments and wing-pads shorter, the latter only slightly tinged with fuscous at apex; the whole surface less tuberculate and the colour rather redder.

Life-cycle. I have records of the occurrence of the imago in all the months from March to December. In addition to this, Blatch (2) makes the general statement that it occurs " during the first four months of the year," so that, apparently, there is no month in which it may not be found. This suggests that there may be no definite time for oviposition, and this again is confirmed by the occurrence, as above, of larvae of all ages together with imagines. I have received from Mr. G. E. Hutchinson eggs laid in the middle of August, and accompanied by full-grown larvae as well as adults. The eggs hatched on August 30th and 31st. Subcortical insects are of course less influenced by atmospheric conditions than those that live exposed, and this fact may tend to obliterate any distinction in the seasons appropriate for the successive stages in their life-history.

Habitat, etc. *A. depressus*, though a subcortical insect, is also found in moss on trunks of trees; but it is not restricted to such positions. Blatch (2) took one flying in hot sunshine, and I have taken it by general sweeping. Bloomfield (3) records it from a sandpit at Guestling, Sussex. J. E. Mason (1) reports it from moss on the stump of a felled ash. Morley (4) records it as common in Bentley Woods, Suffolk, on fir trees while the trees were being felled, adding that it appeared to be gregarious in moss and among pine chips. Donisthorpe has found it under bark of beech, and J. Sahlberg mentions aspen and birch. As with many other subcortical species, the specimens vary a good deal in size. I kept a few of the Gomshall larvae mentioned above for some weeks in a glass tube, on a little white fungoid growth obtained from under the bark where the insects were living.

Distribution. It occurs generally in Europe and also in Persia and Siberia. It enjoys also a wide distribution in Britain, being recorded from all the coast counties from Yorks to Dorset, except Norfolk, and from Cumberland, Lancs, Cheshire, Warwick, Worcester, Monmouth, Glo'ster, Oxon, Herts, Surrey, Berks, and Somerset. The only Welsh record is from Glamorgan. It is not recorded from either Scotland or Ireland, so that its northernmost ascertained limit thus far is Cumberland.

[*Aradus lawsoni* Saund. This species has been included in the British Catalogue ever since Mr. Edward Saunders first described it in 1877 from a single specimen *ex coll.* Lawson, which had no locality label attached.

Mr. Champion (11) has, however, recently shown that it is identical with *A. truncatus* Fieb, a rare species which occurs in Germany, France, and Finland, and that it is probable that Lawson captured it in imported timber, as he did several species of doubtfully British beetles belonging to the *Scolytidae*. There can be little doubt, therefore, that it is not a truly British species and should be omitted from our catalogue; at any rate more authentic evidence is required.]

160. **Aradus aterrimus** D. & S.

D. & S., B.H. 274 (1865); Saund., H.H.B.I., 140 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The only dated British specimen known was taken on May 30th.

Habitat, etc. The above specimen, a ♀, was found amongst chips on the stump of a felled oak (Douglas and Scott, 1).

Distribution. On the Continent it has occurred in France, Spain, Roumania, and Finland. In Britain, only two specimens are known, one, a ♀ from Darenth Wood, Kent, May 30th, 1861, and the other, a ♂ *ex coll.* Harding without mark of locality (Douglas and Scott, 1). Thus the last British record of this species is more than sixty years ago.

160a. **Aradus betulae** Lin.

Lin., F.S. 915 (1758); E.M.M. lvii, 228.

Mr. Champion (18) thus describes this species: " Broader and more elongate than *A. corticalis* L., and readily separable therefrom by the blacker general coloration; the long, comparatively slender antennae, with very elongate second joint; and the more broadly foliaceous sides of the pronotum. The Rannoch specimens, a ♂ and ♀ of which have been given me by Mr. Harwood, may be described thus:

Black, variegated with pale greyish-brown, the expanded margins of the pronotum almost wholly of that colour, the markings on the connexivum reddish. Head with a long, stout central lobe in front; antenniferous tubercles long, acute; antennae long, rather slender, joint 2 more than three times the length of 3, 3 a little shorter than 4; pronotum broadly, arcuately dilated at the sides, four-carinate on the disc and with a longitudinal prominence on each side near the hind angles, the margins with coarse scattered teeth, the one at the anterior angles prominent; elytra rapidly, sinuously narrowing from a little below the base, leaving the broad connexivum exposed; membrane in ♂ almost covering the terminal genital segment, in ♀ leaving two segments exposed. Length 8 to 9 mm."

Ova and **Larvae.** Undescribed.

Life-cycle. These specimens were taken July 10th, 1921.

Habitat, etc. This insect was discovered as British by Mr. P. Harwood, who found it in some numbers under the bark of an old birch tree on the edge of the famous birch-woods at Rannoch. These Scotch examples are darker than the generality of Continental specimens, which have the third antennal joint partly testaceous, though specimens from the Caucasus and the Amour have it black as in the Rannoch specimens.

Distribution. *A. betulae* is found throughout Europe, and in Syria and Siberia. Mr. Harwood's discovery of it was made near the hamlet of Camaghouran, in Perthshire, and it has not yet been found elsewhere in Britain. It is certainly strange that so conspicuous an insect should have remained so long undiscovered, especially in a district so well searched as the Rannoch area.

The genus Aneurus. Until recently *Aneurus laevis* Fabr. and *A. avenius* Duf. have been thought to be identical. Dr. Bergroth (2) has, however, pointed out that this is not the case; they are distinct, though closely allied species, and we have them both in the British Fauna. They may be distinguished thus (Bergroth, 2):

A. laevis Fabr.	*A. avenius* Duf.
(1) Spiracles of fourth, fifth, and sixth abdominal segments placed in the lateral margins.	(1) Spiracles of fourth and fifth abdominal segments considerably removed from lateral margins, those of the sixth placed in these margins.
(2) ♂ oblong-subovate, two and a half times longer than broad.	(2) ♂ ovate, very little more than three-quarters longer than broad.
(3) Fourth dorsal abdominal segment of ♂ with a high conical tubercle in the middle.	(3) Fourth dorsal abdominal segment with no trace of such a tubercle.
(4) ♀ with sixth ventral segment terminating in the middle in two sub-triangular or apically obtuse lobules, which are shortly produced beyond the apical margin of the genital segment.	(4) Sixth ventral segment terminating in the middle in one transverse lobule which is slightly produced beyond the apical margin of the genital segment.

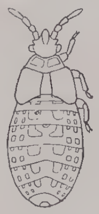
161. **Aneurus laevis** Fabr.

Fab., E.S. iv, 73, 25 (1794); D. & S., B.H. 268 (1865); Saund., H.H.B.I. 141 (1892).

Ova. Unknown.

Larvae. Shaped similarly to the adult in all stages, and extremely flat. Very young larva pale ochreous; head rather darker; a broad longitudinal central area in the thorax concolorous with the abdomen, sides of same forming two rectangular spaces outlined with darker, and with a few dark spots; abdomen with two longitudinal rows of quadrangular reddish-brown spots in the centre (one pair to each segment) the second pairs of these being inwardly emarginate, to leave room for the orifice of the scent-glands; outside these, three rows of small spots of the same colour, the last situated on the margin itself; a large central bright red patch on the first abdominal segment. The later instars marked in exactly the same way, save that all the spots are darker, and the quadrate spots on the thorax, which ultimately become the wing-pads, are the darkest of all; the terminal segment also is dark reddish-brown.

These larvae show no trace of the abdominal tubercle, but the specimens from which the description was taken may, of course, have been such as would have produced females.



Nymph of *Aneurus laevis* F.

Life-cycle. The imago has been found from March to August and in October; larvae of all ages were with the imagines in March. Blathwayt says "under bark in all seasons," but it is uncertain whether his record refers to this or the next species. Here again we have apparently no one definite oviposition period in a sub-cortical insect.

Habitat, etc. The insect is sub-cortical and is gregarious and usually abundant where it occurs. Douglas and Scott (1) give "under bark of fir trees"; Bloomfield records it from a sandpit at Guestling, Sussex, and Linnell has a similar record. It has also been taken under oak-bark (E.M.M., 1904, p. 240). Fallén gives *Betula alba*, and Morley found it in the same tree. Gredler gives "under bark of *Ostraya carpinifolia*" for the Tyrol. Some of these records may, however, refer to the next species.

Distribution. It is distributed through the greater part of the Continent, though there seem to be no records from Italy. It extends also into Asia Minor and Siberia, and is found in Morocco. In Britain it has occurred in Kent, Surrey, Middlesex, Worcester, and Suffolk at least. *A. laevis* has been recorded from seven other English counties as well, viz. Durham, Salop, Bucks, Berks, Essex, Somerset, and Devon, but it is uncertain which of these records really refer to this species, and which to the next. In Kent it has been taken by several entomologists at Darenth Wood, in Surrey at Woking (Champion), in Suffolk at Bentley Woods near Ipswich (Morley), and in Middlesex at Highgate and Ruislip (Newbery). In the Power Collection at the British Museum there are examples *ex coll.* Norman, but without locality labels. It cannot, however, be assumed that these were taken by Norman himself, and in Scotland, because in the year 1881 he appealed to southern Hemipterists to add to his collection specimens of southern species which did not occur in Scotland, and this appeal was, I know, responded to. Excluding therefore these specimens, there are no records from either Scotland or Ireland.

161a. **Aneurus avenius** Duf.

L. Duf. Rech., 54, 1, t. 4, fig. 36 (1833) ; E.M.M. li, 16.

Ova. Unknown.

Larvae. In its last instar, 4 mm., the larva is almost indistinguishable from that of *A. laevis*. The only differences I have been able to detect are that the colour of this species is darker, the ground colour being dark reddish ochraceous instead of the pale ochreous of *A. laevis*, and that the second pair of quadrangular spots on the abdomen are less emarginate inwardly. The central lobe of the face is also a little narrower and more parallel-sided. There appears to be also the same difference in position of the abdominal spiracles as in the adults of the two species.

Life-cycle. The imago has been taken in February, April, June, and from August to October.

Habitat, etc. It is a sub-cortical insect, and I have found it under willow-bark ; J. Edwards has taken it under bark of beech, and also by sweeping.

Distribution. Its distribution on the Continent is very much the same as that of *A. laevis* (Bergroth, 2). In Britain it has occurred in Cambs, Kent, Surrey, Sussex, Hants, Devon, Glo'ster, and Glamorgan ; in Kent at Chatham (Champion), in Surrey at Caterham (Champion), in Sussex at Fairlight (Butler), in Hants at Farnborough and Holt (Power), in Devon at Seaton (Champion), in Glo'ster at Colesborne (Edwards), and in Glamorgan at Cardiff (Hallett). There are no records from Scotland or Ireland.

Family VIII. **HEBRIDAE.**

A family of very small insects of sub-aquatic habits and of world-wide distribution ; only a small number of species have hitherto been described, of which five are Palaearctic, and of these we have but two in Britain. Very little is known of their feeding habits ; American species have been fed in the laboratory on aphides, mosquitoes, etc., which were dropped on the moist earth for them ; but of course their habits in the open may be different.

162 **Hebrus pusillus** Fall.

Fall. Mon. Cim., 71, 19 (1807) ; D. & S., B.H. 266 (1865) ; Saund., H.H.B.I. 142 (1892).

Ova. Unknown. The ova of an American species are large compared with the size of the insect, elongate oval, pearly white in colour, changing to yellow as the embryo develops. They are laid amongst the leaves of *Sphagnum*, more or less concealed in the axils.

Larvae. Unknown.

Life-cycle. The imago is probably to be found all the year round ; I have records for all the months except January, October, and November.

Habitat, etc. Unlike the following, this species is not dimorphous, but is always fully winged. It lives on *Lemna*, *Sphagnum*, etc., especially the former, and is sub-aquatic in habits but is occasionally taken by sweeping, The pile under the body is impervious to wet. In the very dry summer of 1911, I found this insect in a nearly dried up bog in the New Forest; as there was no standing water, the insects selected the deepest parts of hollows in the ground, such as those caused by irregular shrinkage, footprints of cattle, etc. Here they were more or less in shade, coolness, and damp.

Distribution. It is distributed all over Europe to Lat. 68° and occurs in Algeria, Turkestan, and the Canaries. In Britain it has been found in all the coast counties from Norfolk to Dorset, and in Middlesex, Surrey, Warwick, and Glo'ster, a total of eleven counties. There are no records from either Wales, Scotland, or Ireland. Thus its northern limit is Norfolk.

163. **Hebrus ruficeps** Thoms.

Thoms., Op. Ent. (1871); Saund., H.H.B.I. 143 (1892).

Ova. See preceding species.

Larvae. These are very like the apterous, or rather brachypterous form of the imago.

Life-cycle. The imago is to be found all the year round. I have records, British or continental, for all the months. Larvae may be obtained during the summer. The over-wintered forms of the imago are considerably darker than those that are newly formed at the end of the summer, and they are also rather larger, at least, the ♀♀; but this is probably due to the development of eggs, which would apparently be laid in spring. July is probably the month when fewest imagines are in existence. They can stand cold readily; Kuhlgatz records having found them under a 16 cm. layer of snow, wintering as adults in November, and has also thawed them from ice in January.

Habitat, etc. The species is dimorphous, the brachypterous form being the usual one. The macropterous is very rare, and I know of only two British examples, one taken by T. R. Billups at Loughton in Epping Forest (Saunders, 29), and the other by myself on Leith Hill, Surrey. *H. ruficeps* lives amongst the wettest *Sphagnum* and is sub-aquatic in habits. It is usually extremely abundant where it occurs. I have kept some of the over-wintered examples for some weeks, by enclosing them in a tube with *Sphagnum*. Though I watched them frequently, I never saw them feed, but possibly they did so during the night. Of course the food could only have been either the moisture on the *Sphagnum* or the juices of the *Sphagnum* itself. Kirkaldy records it also from *Lemna*. This species differs from the preceding, not only in the shorter basal joint of the antennae, but also in the shorter tarsi, and in the macropterous form, not only in the whiter clavus, but also in the very much smaller and much less glittering golden hairs on the elytra, which have also a long pale brown streak in the centre of the corium, which does not exist in *H. pusillus*. The clavus in *H. pusillus* is occasionally almost as completely white as in *H. ruficeps*, but even then the other features mentioned above will enable its identity to be decided; the membrane of *H. pusillus*, too, has three white dashes, which are absent from *H. ruficeps*.

Distribution. It is found in Northern and Central Europe and in Turkestan and Siberia, but does not occur so far north as *H. pusillus*. In Britain it is recorded from the coast counties from Suffolk to Devon, except Sussex, and also from Cumberland, Cheshire, Staffs, Hereford, Oxon, Cambs, Herts, Berks, and Surrey, and it was found by Reuter in Scotland. The only Welsh records are from Radnor and Glamorgan, and there are no Irish ones. As, on account of its very small size, it is difficult to see unless the *Sphagnum* is closely examined, it may easily have been passed over in other counties.

Family IX. **GERRIDAE.** (Hydrometridae Osh.)

This family contains a collection of remarkable and most heterogeneous insects, necessitating its subdivision into groups. The one point they have in common is their association with water, not always fresh water, however. Most of them live on the surface of the water, whether fresh or salt, although our British fauna contains none of the maritime species. But one, *Aëpophilus*, is actually submarine in habits. A few others live on the water weeds that float on the surface of ponds, or on the damp banks of ponds. The Palaearctic Fauna contains forty-six of these insects, and our British share of these is only fifteen. They are probably all carnivorous in their tastes.

Bordas records that species of *Gerris* (*G. paludum* and *lacustris*) have voluminous salivary glands, which occupy the whole of the dorsal face of the first two thoracic segments and completely cover the œsophagus and the first part of the intestine. On the other hand, scent-organs are absent from all this group, whether in their larval or adult stages.

It should be noted here that *Aëpophilus* is certainly not rightly placed in this family. Bergroth (1) maintains that it should be put in a distinct family between the *Saldidae* and *Ceratocombidae*, as is done in Lethierry and Séverin's Catalogue, and also in Oshanin's Verzeichnis.

Sub-family I. **Mesoveliina.**

This sub-family contains a single genus only, and the species are closely allied. They *run* very rapidly on the surface of pond weeds, their agility being greater than that of any other member of the family. A common Indian species leaves the water at night and comes readily to light. This is generally impossible with our British species, which is almost always apterous in both sexes. The sub-family is very widely distributed, occurring in both Old and New Worlds, though the number of species is small. They are found in both temperate and tropical regions. Only two Palaearctic species are known, and of these we have but one.

164. **Mesovelia furcata** Muls.

Muls. Ann. Soc. Lin. (1852); Saund., H.H.B.I. 146 (1892).

Ova. Early in September, 1893, I opened the body of a gravid ♀ and took from it thirteen eggs, which were packed closely together longitudinally and left scarcely any space for the viscera, which, indeed, seemed almost absent. These ovarian eggs are nearly cylindrical, but slightly arcuate in outline. They are of a greenish colour. The freshly laid egg is a long, whitish body, very large in proportion to the size of the insect, about 1 mm. long, i.e. about ¼ of the length of the entire ♀ insect. It is a slightly curved cylinder, rounded at one end, and with a circular collar at the other, reminding one of that of *Cimex lectularius*. In an American species, the anterior end of the egg is curved, and the egg itself is inserted in the stem of some plant, so that its exposed end is circular, and the body of the egg lies parallel to the stem. Probably the same holds good of our British species.

As to the method of oviposition, Hungerford gives the following particulars about an American species: The female frequently explores the stem with the tips of her beak and antennae if indifferent in the matter, but if eager to oviposit, she mounts the stem without delay, raises the abdomen slightly, unsheaths the ovipositor and turns its tip down to the surface of the stem. At times the surface is tested at several points—again if the first point of contact is favourable, the tip is caused to quiver back and forth till it gains a footing, and then rocking the body slightly from side to side the entire drill is caused to rotate or twist back and forth on its axis, rapidly at times, or again more slowly as may suit the necessity of the work, until a hole is effected, and the ovipositor is buried to its base. During the deeper drillings the longitudinal alternate thrusts of the drill part are apparent. The first part of the operation at least involves much the same sort of motion as one employs in making a hole with a gimlet or awl. It takes but a moment in the spongy, water-soaked stem of a sedge to drive the instrument up to its base. Then, after a moment of apparent quiet, the ovipositor is lifted slightly and the egg is forced by a series of abdominal contractions down the ovipositor and into the cavity reamed out to receive it. A number of eggs may be imbedded thus in the stem before the ovipositor is sheathed, each one requiring a separate puncture. In starting the drill in a particularly stubborn or inconvenient place, the female not infrequently uses one of her hind legs to steady and stiffen or support the drill.

Larvae. Last instar, 2 mm. These are very similar to the apterous imago. Green, with piceous or black markings; these consist of a central line on the head, the whole of the thorax, except its laminated lateral borders and an oblique oval spot on each side of each of its segments, the abdomen, except the connexivum, two spots on each segment, and the posterior margin of the segments; legs and antennae piceous; posterior tibiae very strongly spined; two strong black setae near the end of each of the femora on the outer margin; a few strong black setae also on basal joint of antennae; whole surface finely pilose; underside pale; tarsi one-jointed, claws terminal.

A very young larva, perhaps first instar, a little over ½ mm. in length; broad, parallel-sided, slightly narrowing behind; head short; eyes large, touching pronotum; thorax forming nearly half the length behind the head; piceous except for a yellowish margin to body from beginning of mesonotum to end of body; surface with a very few scattered hairs; legs and antennae piceous; hind tibiae long, with strong black hairs; intermediate tibiae with similar, but less strong, hairs; basal joint of antennae also with a few black hairs; antennae longer than body, last joint almost as long as preceding three together; a few black hairs near apex of femora; tarsi one-jointed; claws terminal.

Life-cycle. The imago is found from July to October, the July record being continental. Many quite young larvae may, however, sometimes be found in August, although I believe *Mesovelia* to be generally an earlier insect in attaining maturity than the rest of the surface Hemiptera. On the pond mentioned below were *Gerris paludum*, *G. odontogaster*, and *G. argentatus*, *Microvelia* and *Hydrometra*, and all of them showed plenty of specimens either actually in the larval condition, or only just transformed into imagines and still teneral, but I found only a single specimen of a *Mesovelia* larva, all the rest being adult even when I first found them, at the beginning of August. On the other hand, most of the specimens found by me on a pond at Dallington in August were larvae, and few were adult. As mentioned below, a posthumous egg was laid by one of my captures in September; but it would perhaps be unwarrantable to conclude from the laying of this egg that oviposition normally takes place at the end of the summer, since the process may have been accelerated by the shock of drowning. But whatever the condition of the insect during the winter, whether they hibernate as imagines or as larvae, or whether they pass the winter in the egg condition, or whether the ♀♀ only survive till the next season, impregnation certainly takes place in the summer. In an American species, the winged forms often break away the membrane with the hind tibia, thus exposing the end of the abdomen. Such an action can, of course, only very rarely take place in our British species, if at all. This same American species passes the winter as adults, which begin ovipositing in the spring, and there is a succession of generations throughout the summer, each cycle requiring about twenty-four days.

Habitat, etc. In August, 1893, I found a colony on a pond in an orchard at Fifield, Berks. The pond was a long, narrow one, about 120 feet by 30 feet; on its banks were growing *Alisma*, *Polygonum*, *Lycopus*, *Mentha*, *Bidens*, etc., and in the water was abundance of *Potamogeton natans*, together with *Polygonum*, *Chara*, and some other pond weeds. *Mesovelia* was to be found on the leaves of the *Potamogeton*, but, in consequence of the greenish colour and extreme slenderness of the insects, it was exceedingly difficult to see them from the banks, and, in fact, I could never be quite certain that I did distinguish them, and the numerous small Diptera which were also running about over the leaves did not make the task any the easier. *Microvelia*, which was also present in great numbers, could be seen without any difficulty, though so much smaller. Promiscuous skimming of the surface with a water-net, however, yielded a plentiful supply of the previously invisible *Mesoveliae*. With the exception of a single winged ♀, taken on the last morning of my stay at Fifield, all that I found, probably as many as one hundred and fifty, were apterous.

I kept a number of *Mesoveliae* under observation in a glass jar for three weeks. When disturbed they were extremely lively, darting about over the leaves of the *Potamogeton* and the water with equal ease and extraordinary rapidity, in fact they moved under such circumstances far more rapidly than any other of our aquatic Hemiptera. On the water they maintain the same position as on the leaves, and their motion is in both cases an insect's ordinary walk or run, i.e. the corresponding legs of the opposite sides are moved alternately as in *Hydrometra*, and not simultaneously, as in *Gerris*. The position on the water is intermediate between that of *Hydrometra*, in which the body is kept high above, and that of *Microvelia*, or *Velia*, in which it is close to the surface, and as with *Hydrometra*, only the tarsi are in actual contact with the water. When resting, they often assume a frog-like position, the ♂ especially sloping its body, with head in air, and hinder extremity almost touching the leaf on which it is standing. They often rested also on the sides of the jar, climbing up just above the water level and remaining there, out of contact with the water, but with head turned towards it, so as to be ready on the slightest alarm to dart down to a position of greater freedom.

They are carnivorous in tastes. I kept them supplied with a variety of recently killed small insects, and on different occasions saw them sucking a *Smynthurus* (Collembola), a *Crambus* (Lepidoptera), a *Chalcid* (Hymenoptera), and apparently most unpromising of all, a *Hydrometra*. The rostrum is extremely flexible, and in feeding is bent into whatever position enables the insect to reach the most easily assailable parts of its prey. The setae do not seem to be powerful enough to pierce such a hard integument as covers the greater part of the body of *Hydrometra*, and in this case, therefore, advantage was taken of the softer skin which occurs at the junction of the coxae with the body, and the rostrum was thrust in there. One of the ♀'s, after taking a long draught of *Smynthurus* blood, walked to the edge of the floating leaf on which its prey was lying, dipped its rostrum into the water, and then rubbed it with its fore legs. As it is evidently of the utmost importance that the channel of the setae should be kept open and clean for the passage of liquid, I have little doubt that this action was undertaken for cleansing purposes, to remove congealed blood that may have oozed from the body of *Smynthurus* and collected on the rostrum. Still, it is quite possible that the insect may have been drinking as well, for I have seen a *Hydrometra* similarly dip its rostrum into the water, without having previously partaken of food, but in that case it did not rub the organ on withdrawal. I should imagine that the usual food would be the small Diptera and Hymenoptera with which the leaves of the *Potamogeton* swarm, and that this is the reason for their selecting these leaves as their usual headquarters. But whether they catch their prey alive, or avail themselves of the numerous drowned or partially disabled specimens that are sure to be found lying about, I cannot say, since the supplies I gave them consisted, for convenience sake, only of freshly killed insects, and the difficulty of seeing them on the pond prevented my deciding the matter by watching them in the open. There is also the further possibility of their attacking the larvae of the Homopteron *Cicadula cyanae* Boh., which feeds on the *Potamogeton*, and which I have generally found associated with *Mesovelia*.

Mesovelia is scrupulously cleanly in habits. The specimens I was observing, when first put into their jar, were incessantly busy cleaning themselves. Each leg on either side rubs its next neighbour on that side; the fore pair also clean one another in the manner with which the house-fly has made us familiar. With the fore legs also the insect cleans its antennae and rostrum, drawing the antennae between the tarsi, and then running the latter down the rostrum, taking great care that the tip of that instrument is thoroughly cleaned. With the second and third pairs of legs they clean the back, by rubbing the tarsi over the surface. When the above toilet had been gone through, I occasionally saw them bob down and bring the underside in contact with the surface on which they were resting, but whether this was with a view to cleansing, or for some other reason, I cannot say. I do not think *Mesovelia* ever voluntarily goes below the surface, and in fact they would probably find it a difficult matter to do so. When a specimen was purposely submerged it rose at once, but experienced some difficulty in getting above the surface again, on account of the surface fluid tension, which required a struggle to overcome, but when once up, there was no further difficulty, and it at once set to work to brush itself down with its tarsi. When *Mesovelia* was plunged beneath the surface, a film of air could be seen clinging to its ventral surface, just as with beetles like *Hydrobius*, etc. There were some *Hydrae* (fresh-water Polyp) in the jar, and I was interested in watching an encounter between one of these and a *Mesovelia* which I had submerged. On touching the tentacles of the polyp, the insect became at once entangled in the stinging threads, and was evidently much alarmed ; it struggled spasmodically and with great energy, and several times freed itself, only to become again entangled by further movements. At last it got clear and rose to the surface, and then a most vigorous cleaning took place, when it appeared that one of the fore legs was paralysed. Again and again the little creature stroked the injured limb out straight, but each time it returned to the cramped position, and could not be put to the ground. The effects of the stinging, however, went off after a time, and it completely recovered the use of the limb.

Pairing took place several times, the ♂ mounting on his partner's back. She, meanwhile, remained perfectly unconcerned, either running about with her burden, or stopping to clean herself. Sometimes she tried to dislodge the ♂ with her two hind pairs of legs. By the end of the three weeks, the bodies of some of the ♀♀ became greatly distended. I hoped to have seen oviposition take place, but in this was disappointed, nor could I discover that any eggs had been laid on the leaves or on the sides of the jar. On leaving Fifield, I attempted to bring some specimens with me, keeping them as carefully as I could in a small jar of water ; but the shaking in the railway was too much for their constitution, and by the end of the journey most of them were drowned, or, at any rate, appeared to be. These I at once set ; but possibly some of them might have recovered had I given them a chance, for I found next day that one had laid an egg on the card (Butler, 15).

The insect is dimorphous. The macropterous from of the ♂ is fully winged, that of the ♀ partly so, the membrane being absent. Possibly this may have been torn off by the insect itself. Both these forms seem to be very rare ; I have taken two of the ♂ and only one of the ♀. The undeveloped form is quite apterous. As this form is not described in Saunders' "Hemiptera-Heteroptera of the British Islands," I append a description :—

"Body sometimes greenish, with all the sutures black, sometimes almost black throughout by reason of the spread of the sutural pigment, with only a faint greenish tinge ; ♂ with body narrow and almost lanceolate, ♀ broader and long oval in shape ; connexivum well developed in both sexes, especially so in the ♀ ; both sexes quite apterous."

Having learnt at Fifield how to capture *Mesovelia*, I soon found it in other places, especially at Dallington, Sussex, and in Epping Forest. It is probably less rare than has been generally supposed, and is no doubt often passed over because of the difficulty of seeing it, and because of the larval appearance of the usually occurring form.

According to J. Sahlberg, it is found also on the leaves of the water lilies, *Nymphaea* and *Nuphar*, and also on *Sparganium* and *Lemna*.

Distribution. It is distributed over Central and Southern Europe, North Africa, Syria, Trans-Caucasia, and Siberia. It is said in Oshanin's "Katalog" to occur also in the Australian Region.

In Britain it has been taken in seven counties only, Staffs, Derby, Essex, Surrey, Sussex, Berks, and Devon. In Wales, Scotland, and Ireland it is still to seek.

Sub-family II. **Aëpophilina.**

This extraordinary sub-family contains at present only a single species, which has been found chiefly in France and Britain. It is out of place in this systematic position, the only point of connexion being its association with water, and there is not any adaptation to an aquatic life common to it and its associates to link them together as there is e.g. in the Cryptocerata.

165. **Aëpophilus bonnairei** Sign.

Sign Bull. Soc. Ent. Fr. 9 (1879); Saund., H.H.B.I. 145 (1892).

Ova. Undescribed.

Larvae. An intermediate instar, 2¼ mm. Narrow, elongate, reddish-yellow, with head reddish and eyes red; contents of abdomen showing through as black; the whole insect thickly covered with a long yellowish pilosity; legs pale yellowish, antennae slightly fuscescent, both pilose; claws long, not much curved; pronotum transverse, trapezoidal, anterior angles rounded; the tarsi appear to be one-jointed; abdomen finely margined; no trace of wing-pads.

Life-cycle. The imago has been found all the year round, except in January. Larvae have been met with in February, April, June, and November. Keys bred two examples, which were taken as larvae in February and matured on the 12th June following. Another example taken in April was quite perfect, while one taken in August showed signs of wear. It is evident, therefore, that the insects complete their life-cycle at different times in the year.

Habitat, etc. This strange insect is to a large extent submarine in habits, living under stones below high-water mark, so that it is submerged for hours at a time. It was originally discovered in September, 1878, by Baron Bonnaire, in the Isle of Ré, France, under stones which were deeply imbedded in mud at low water. Here it was in company with the Coleopteron *Aëpus robini* ("Bull. Soc. Ent. Fr," ix., 1879). The earliest British specimen known came from Polperro, Cornwall (E.M.M., xviii., 145). The greater part of what is known in this country about the habits of the insect is due to the labours of Mr. J. H. Keys of Plymouth. It was first noticed as British by Frederick Smith, the well-known Hymenopterist, and the second occasion of its capture was in 1884 by E. D. Marquand, who took it again in 1886. He thus describes the second capture: "On November 12th last, I was searching for Polyzoa during the low spring-tide, at Mousehole, about 2 miles from Penzance, when, at the very edge of the Laminarian zone, I saw a remarkably fine specimen of the large starfish, *Uraster glacialis.* I pulled it out of the cranny where it lay high and dry, and turned it over, and then saw, running swiftly over the shiny cream-white underside of the starfish, a minute object, which I took for an *Acarus*, and "bottled." A moment's glance with the lens, however, showed me that it was a bug of some sort, and a careful examination of the *Uraster* furnished three mature examples, which I secured. Why a small colony of these Hemiptera should have selected this particular starfish to locate themselves upon I cannot conjecture, because I have examined scores of the same species at various seasons of the year on the same rocks and never saw an insect upon any. The coast here is entirely rocky, so that *A. bonnairei* is by no means confined to muddy or sandy shores."

Keys (1) described his experiences as follows: "On the 7th of November (1887), I found a larva; it was taken in the act of crawling about the underside of a flattish stone, about 10 inches square by 2 inches thick. There were no seaweeds attached to the stone, nor any growing within 8 inches of it; and beneath it there was the usual composition of beaches in this neighbourhood, consisting of sand, gravel, stones of various sizes, and a sprinkling of limpet and other shells. The beach is very rocky, some of the rocks running into the sea much beyond low-water mark, and others terminating at different points above it; the beach is, moreover, strewn with large stones and boulders, some of which could not be moved without the aid of a lever. Speaking generally, the stones and rocks are densely clothed with the common *Fucus.* The situation of the stone under which I found the larval *Aëpophilus*, was about 37 feet from dead low-water mark, as nearly as I can calculate.

"On December 4th a mature specimen was found about a dozen feet further up the beach than the first example, but under precisely similar circumstances, excepting that the stone under which it was found was nearer to the seaweed covered rocks, the lowermost plants resting on the stone."

Some three years later he says: "I luckily found one under circumstances similar to my former capture and within a few feet of the spot in which that one was taken. I brought home a submarine worm, which I chopped up and gave to it, and had the satisfaction this morning of observing the bug in close proximity, rubbing or cleaning its proboscis with great gusto, suggesting the idea that it had just enjoyed its morning meal. I had intended to rig up a small aquarium and watch the insect's movements therein; happily, the notion occurred to me to try whether or not it could *swim* before I did so. Accordingly I put our little friend into about a quarter of a wineglass of sea water, when lo, it sprawled about in an *utterly helpless* manner ; indeed, its motions were similar to those of a drowning fly. I removed it from the water, and it proved, although it had been in the glass but a few seconds, to be in a most piteous plight ; its antennae and proboscis were in close adherence, and caused the insect considerable effort to liberate them, and its pubescence was completely wetted. This result rather astonished me. I have repeated the experiment with like result. I also observed that it did not attempt to walk when carefully placed on the surface of the water ; it was motionless. I gently stirred the water, but it was content to be carried around without attempting any motion on its own account ; I then popped it under the water, and it would, I think, quickly have been drowned had it not been removed" (Keys, 2).

And yet again : " After an interval of nearly five years I have again the pleasure to record the capture of *Aëpophilus bonnairei* Sign., and this time with rather better results. On April 28th I took a mature specimen near the old locality, but about thirty paces further seawards than the example last noted. On comparison of the two I was struck with the fact that whereas my old specimen taken in the month of August showed signs of wear about the apex of its elytra, the example now taken in the month of April was quite perfect ; it was also more active. On the next day I felt constrained to go again and to search as far out seawards as possible. Accordingly, climbing over a reef of rocks which ran out a considerable distance into the sea, I came to a transverse channel, the bottom of which was strewn with large boulders, with smaller stones scattered between them and with the interspaces filled with a mixture of gravel, broken shells, and a little clayey matter. Over the whole (the gravel excepted) there was a thin coating of algaic growth, as well as the usual complement of higher *Algae* to be found in such places. The first stone lifted revealed a dozen or more undeveloped specimens on its under side. Beneath the stone adjoining, in a space that could have been covered by a crown piece, there was a group of the undeveloped forms, with a single mature specimen in their midst, just as one often finds a family of earwigs, or sees a hen surrounded by her chickens. On exposure to the light they at once commenced to scamper off. Two more precisely similar cases were observed, and two or three mature specimens were taken separately in the gravel ; the undeveloped forms also were frequent, in companies and singly, without any adult near them.

" To give as good an idea as I can of the conditions under which *Aëpophilus* lives, it will perhaps be interesting to mention that I commenced to work at 2.45 p.m. ; by about 3.30 the flowing tide was wetting my feet as I knelt down, and I had to beat a retreat, and in a few minutes more the bottom of the channel was covered. High tide occurred that night at

8.38 p.m., from which it will be seen that the insects are under water for some ten hours out of the twelve necessary for ebb and flow.

"On April 30th I again went to the habitat, and by removing one or two large stones lying at right angles to each other, secured five mature specimens in the compost that was lying between them; but on May 8th I had my greatest haul, when I caught no less than twenty-five mature specimens. It may further be observed with regard to condition that there was no foul mud near at hand, and the stones with the insects beneath were generally imbedded slightly in the gravel, and invariably in such a position that the water drained quickly away with the ebbing tide." Thus this spot seems to have been the headquarters of the species, and it is certainly remarkable that the headquarters should be a spot which is exposed to the air only during spring tides, and then only for a short period. Mr. Keys continues:

"I have experimented with living specimens both young and mature in the hope of seeing them feed, but they are constantly out of sight on the underside of the stone provided for them; and although I looked several times daily I have not been able to detect their proboscis in operation. They hide in companies in little holes in the stone, packed together as closely as possible, or rest on the algaic growth thereon. I observed one specimen with its head stuck right into this matter, and it seems probable that it is on one or other of these low *Algae* that they feed. At all events, there is nothing else that I can see on which my living specimens can subsist, and they are as lively and fresh after six days' captivity as when first brought home. Growing on the same stone I have three species of *Algae* (a *Fucus*, and a red and an olive kind), but these they do not touch, I am quite sure" (Keys, 3).

Writing at a later date the same observer describes an apparatus by which he was enabled to rear two specimens to maturity and at the same time to keep them under observation even when they were underneath a stone. He constructed a glass box 10′×6′×4′. "Four wooden sides were fixed together, glass fitted inside, and a glass top and bottom added. The box was then pivoted at the top of and between two uprights 15 inches high, nailed to a wooden base. Being suspended in this way one could examine the underside with ease, as well as tilt the box as desired. Then a suitable stone, well covered with muddy slime, etc., from the habitat, was selected and carefully brought home and deposited in the box. The *Aëpophili* were then added. A bottle of sea-water was also procured with which to keep the stone as nearly as possible in its original wet state. This was effected by gently sprinkling as often as necessary. As soon as it was desirable, a fresh stone was obtained." With this apparatus he succeeded, after many failures, in rearing the two examples already referred to, which, except for some deficiency in size, were perfect specimens. "What the creatures fed upon I am unable to say, but it must have been something provided by the slimy stones. It is hardly conceivable that the insects lived for four months and endured the physical strain of one or two moults without sustenance.

"Instinctive solicitude for the young is much in evidence with the species. It was common to see in my breeding cage, on the underside of the stone, a circle of young with an adult in the centre, the heads of the immatures being all oriented towards this centre. On my lifting out the stone, the adult would almost instantly alarm the young with a rapid tap with each antenna alternately, and the whole troop would scamper round to the other side of the stone with great speed" (Keys, 6).

Champion (2) found larvae in the Isle of Wight clinging to the lower surface of very large, deeply imbedded stones on the beach, just below high water mark, in company with the Coleoptera *Aëpus marinus*, *A. robini*, and *Micralymma brevipenne*. He also found the adult with *Actocharis readingi* at Falmouth.

The insect is occasionally afflicted with oligomery of the antennae. Douglas mentions one with three joints in the right antenna instead of four. The second joint was slightly lengthened and thickened, the third (or terminal) shortened, thickened, and abruptly ended.

So far as known at present it is always brachypterous.

Distribution. Very little is known as to the geographical distribution of this insect. As mentioned above, it was first discovered in France; besides that it has been recorded from Spain (Bergroth, 1) as well as from our own country. In England it has been found on the shores of the Isle of Wight, Dorset, Devon, and Cornwall; it has also occurred in the south and on the east coast of Ireland, near Dublin, which is its northernmost limit.

Sub-family III. **Hydrometrina.**

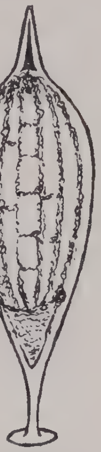
This sub-family contains a single genus which is, however, of world-wide distribution; it is noteworthy for the extreme slenderness of its representatives, combined with an extraordinary elongation of the head. *Hydrometra* is also remarkable amongst British water-bugs, for the almost unique habit of *walking* on the surface of the water. Four Palaearctic species are recorded, of which only two are European, and one of these British.

166. **Hydrometra stagnorum** L.

Lin., F.S. 971 (1761); D. & S., B.H. 576 (1865); Saund., H.H.B.I. 148 (1892).

Ova. Leuckart thus describes the egg of *H. stagnorum*. Elongated and slender, about 1 mm. long and ½ mm. broad, narrowed behind and finally drawn out into a long, thin, solid pedicel, the end of which carries, like *Corixa*, a round disc; the anterior and blunter end of the egg is furnished also with a long and slender end of the micropyle, the canal of which is of considerable breadth and seems to run forward into a thin-skinned funnel;

the chorion is rather thick and strong, and at first entirely structureless except for some slender longitudinal traceries connected together by still more delicate anastomoses ; later on, there spreads out on each side besides these lines a row of small round projections, separated from one another by depressions ; the end of the micropyle acquires a scaly appearance by reason of similar protuberances, while the pedicel remains smooth.



Egg of *Hydrometra stagnorum* L. (After Leuckart.)

J. O. Martin gives the following particulars about an American species, *H. lineata* : " When the weather becomes warm enough, egg-laying begins ; the female becomes restless and stalks about in search of a place to deposit an egg. . . . Backing up to a grass-stem, or almost any firm object which rises above the water, she exudes from the genital opening a drop of a gummy, gelatinous substance, which she then presses against the object which has been chosen to support the egg. This sticky mass is the base of the egg-stalk, and hardening very soon, fastens the egg in place before it has left the body. The egg is long and spindle-shaped, about 2 mm. long, that is to say about one-half the length of the abdomen. The young nymph emerges seventeen days after oviposition, and is light green in colour." In this American species hatching takes place by the embryo bursting through the side of the egg, and the long head is bent over to accommodate the embryo in the egg.

Larvae. The nymph closely resembles the undeveloped form of the adult. Fore parts pitchy-brown with a more or less distinct pale central line, and abdomen reddish, with a comparatively soft integument, and the connexivum not very distinctly marked ; wing-pads long and narrow ; pronotum not produced so far backward as in the adult, and consequently the scutellum is exposed ; tarsi composed of a single joint only, although the adult has three ; whole insect clothed with a distinct pilosity, which is longest on the head ; in the adult this becomes a very short adpressed pile, which is hardly visible ; near base of head a rather strong black seta arises on each side from a black point ; these are present in the adult also. In an earlier instar, 3 mm., there are no wing-pads, and the head and thorax are proportionately shorter, the latter being shining and glabrous, otherwise it is similar to the later instar. In both instances the tarsi are one-jointed and the claws terminal.

Life-cycle. I have found the insect just maturing or recently matured at the beginning of August ; the cast larval skins may be found in numbers under stones in river beds or on the banks, clinging to irregularities by the claws, and with the bodies much raised and pointing forwards, indicating the effort which was necessary to enable the insect to free itself from its slough. Some specimens mature later, and a few quite young larvae may still be seen in August. The adult is found practically all the year round; I have records for all the months except January, February, and November. I do not think there is more than one brood during the year, and this matures at the end of July or beginning of August, the insect passing the winter in the adult condition, and therefore presumably the eggs would be laid in the following spring. But evidently some at least of the insects of any one year live long enough to meet those of the succeeding generation. Bueno, speaking of an allied American species has, however, a different idea. He says that the period between oviposition and the emergence of the insect varies with the temperature. In the cool days of spring it is as long as nineteen days, in midsummer from nine to ten days. The nymphal stages are five, and the time between the moults about three days, giving a little over a fortnight for the larval instars. The life-cycle can therefore be completed in from twenty-five to thirty-five days, and thus this would give from three to five broods in the course of the summer. He adds, " This must be the case, as young and old adults and nymphs in several stages can be found together at almost any time during the warm weather. But I do not think this is in agreement with what occurs with *H. stagnorum.*

Habitat, etc. This insect is able to walk, not only on water weeds and the damp banks of its pond, but also actually on the water itself, not skating as the *Gerrides* do, nor running rapidly, as *Mesovelia* does, but walking slowly, moving its legs in exactly the same way as on land, i.e. alternately, and keeping its body well up off the surface. Thus the minute tarsi are all that are in contact with the water surface, and the extremely light weight of the insect, coupled with the pilosity of the under surface of the tarsi, are insufficient to break the surface tension, and so they prevent the tarsi from becoming wet, and enable the insect to perform the difficult feat of walking on the water. A specimen which I kept in the same jar as the *Mesoveliae* before mentioned, walked on the leaves of the *Potamogeton*, and would go to the edge and thrust its rostrum into the water. When purposely submerged it found the greatest difficulty in emerging from the water, its hair-like legs drawing out a thin film of water as it thrust them above the surface, the tension of which was sufficient to drag them back again. When it had at last got clear, and apparently escaped from the troubles of capillarity, it was unable for some hours to venture safely on the water again; each time it attempted to do so its tarsi gradually slid outwards and its legs sank farther and farther till the poor creature was left sprawling upon the surface in a perfectly helpless condition. By refraining for some hours from trusting itself to the treacherous element, it ultimately recovered its power and was able to move about over the water as freely as before (Butler, 15).

They hide in large numbers behind the herbage on the banks of the pond they frequent, and here are very difficult to see against the damp soil, which exactly harmonises with their own colour ; moreover, the extreme thinness of the legs and body make them very difficult to see, even when one is looking straight at them. *Hydrometra* is generally considered to be associated with still water, on which alone it could have any success in walking. But it is also found by the side of running water, in the damper spots, for I have found it on river banks, and once on a small stream which was trickling down the cliffs near Hastings. Morley also records it from running water in Suffolk. Parfitt speaks of finding it on brackish water as well as fresh. Bedwell has taken it in flood refuse.

The insect is dimorphous ; the usual form has hemielytra so abbreviated that they extend no farther than the level of the posterior coxae ; the developed form is very seldom met with ; there is one specimen in the Power Collection, taken at Horsell, Surrey. In the brachypterous form the hemielytra have two very strong and prominent parallel nervures running longitudinally, and two or three transverse nervures connecting these. Brachyptery may possibly be an advantage to these various water-bugs that exhibit such forms, as, by preventing them from trusting themselves to the air, it would seem to lessen the chances of accident to life and limb. But on the other hand, at least occasional winged specimens would seem to be a necessity to ensure the geographical extension of the species. And further, our British species is exceptional in being dimorphous. Bueno gives an interesting account of the feeding of an American species of this genus, and the methods it adopts are probably similar to those of our own species.

According to Nicall it is sometimes called the " Water-gnat."

Distribution. *H. stagnorum* is distributed throughout Europe and occurs also on the north-western coasts of Africa and in the Canary Islands, Asia Minor, and Siberia. It appears to be very generally distributed in the British Islands, being included in all the county lists I have seen except that of Bucks, though there can be little doubt that it is found in this and other unmentioned counties also. In Wales I have records for Carnarvon, Carmarthen, and Glamorgan. It is recorded also from both Scotland and Ireland. The English counties for which there are no records are Westmorland, Salop, Hunts, Beds, Monmouth, and Bucks.

Sub-Family IV. **Veliina.**

This sub-family contains chiefly small insects, some of them very minute. They are not, as both the preceding and the succeeding subfamilies are, of elongate form, nor are their legs inordinately long. Some of them, especially the smaller species, are associated with pond weeds more closely than with the open water, and on these they can run with considerable speed ; those that live on the open water have a fussy, jerky movement, very different from the stately strides of the *Gerridina*. They are of world-wide distribution, and unquestionably large numbers of exotic species yet await description. Ten species have been described as Palaearctic, only two of which have hitherto been recognised as British. According to Bueno, the eggs are deposited in spring on the vegetation coming to the surface.

167. **Microvelia reticulata** Burm. (=M. pygmaea Br. Cat.).

Burm. Hand., ii, 1, 213 (1835) ; D. & S., B.H. 574 (1865) (pygmaea) ; Saund., H.H.B.I. 150 (1892) (pygmaea).

Ova. I know nothing of these ; but Bueno gives the following description of those of an allied but larger species, *M. americana* Uhl. : " Ellipsoid in shape ; colour translucent white, more or less glairy. Under the microscope the chorion is seen to be sculptured in irregular hexagons. As development progresses the eggs grow darker, and at one end the red eyes, the legs, the rostrum, etc., of the nymph are visible through the shell. At the end of about seventeen days the eggs hatch, and the young nymph emerges by a longitudinal slit, about two-thirds of the length of the egg, along one side and the end." These eggs were laid chiefly imbedded in a waterproof jelly, and fastened in masses to the sides of the aquarium, slightly above the water. From this the observer concludes that in nature the eggs would be deposited on rocks and stones, just above the surface of the water, or else on floating sticks.

Larvae. These are similar to the apterous form of the imago, but with the abdomen broader than the other parts, and broadest in its middle. Colour fuscous brown, with a pale median line except on the head ; connexivum, which is very broad, of a paler brown, with a still paler, more or less triangular spot at the inner part in each segment ; on the mesonotum a large and conspicuous ochreous spot ; anterior tarsi one-jointed, others two-jointed. In other respects the larvae are like the apterous adults, and the above description applies equally to larvae of half a millimetre in length and to those of 1 mm. or 1½ mm. I do not know what difference there is in the larvae which will produce the macropterous form, but presumably there would be wing-pads in the last two instars.

Life-cycle. The larva has been found in March, June, and August. The imago occurs almost all the year round ; I have records for all the months except February, July, and October. This seems to imply that there is more than one brood in the course of the year. As the larvae are more abundant in the summer than at any other time, it is probable that the greatest number of specimens of the adult belong to the summer brood, and that these, or at any rate some of them, hibernate as imagines, becoming contemporary also with the earlier brood of the following year. If this be so, July would apparently be the month in which there would be least likelihood of meeting with imagines, for by that time those of the preceding year would have died off, and the generation arising from the summer larvae would not yet be mature. Such a cycle would tally with my own experience, so far as July is concerned. I have found both apterous and winged imagines in March, but the majority of winged specimens have occurred to me in August. *M. americana* has five larval instars, and the entire period of development from oviposition to the maturation of the adult is from thirty-six to forty-six days (Bueno, 3).

Habitat, etc. This minute insect is gregarious, like the *Hebridae*, and often occurs in considerable numbers. It is found on ponds, ditches, and canals. It *runs* on water, moving its legs as for walking, and not as the *Gerrides*, but it never walks, as *Hydrometra* does ; the movement of the legs is always rapid and the body is not raised above the surface. I have kept over-wintered examples for several weeks, by enclosing them in a tube with *Sphagnum* ; but, though I frequently watched them, I never saw them taking any food. Possibly they fed at night ; all they could feed upon was the moisture on the *Sphagnum*, or the juices of the *Sphagnum* itself. They remained so lively during all the weeks I was able to keep them, that it is scarcely conceivable that they practised abstinence from food all that time. As the generality of water-bugs seem to be carnivorous, probably the favourite food of this particular species is some kind of minute animal life. Such may possibly have been present amongst the *Sphagnum*, without being recognised, but certainly I saw nothing of the kind. Pond water may possibly be sufficiently charged with organic matter to yield all the sustenance such minute insects need. Bueno fed *M. americana* on flies, and Hungerford speaks of its sucking Ostracoda, impaling them by thrusting the beak between the valves and thus holding them up in mid-air till they are sucked dry, but *M. americana* is much larger than our species.

Microvelia is a cleanly little creature. It often spends much time in cleaning its tarsi, and this it does by rubbing two together, the intermediate with either the posterior or the anterior. In the case of the anterior, the mandibular and maxillary setae are also thrust out from the labial trough, appearing as a testaceous licking apparatus, and this is passed over the tarsi while they are being rubbed together. Probably saliva is passed down the setal channel at the same time, as the salivary glands are connected with this by means of an apparatus called a salivary syringe. According to Kirkaldy, it does not use its antennae as tactile organs.

It frequents the various floating pond-weeds, as well as very wet *Sphagnum*, especially when this grows by the side of ponds. Schumacher reports it from amongst tufts of *Carex stricta* L.

It is dimorphous, and occurs in both a completely apterous, and a fully winged condition; there is no brachypterous form, and in this respect, therefore, it differs from *Hebrus ruficeps*. The apterous form is by far the commoner, though the macropterous one sometimes occurs in considerable numbers.

Distribution. Until recently, our British *Microvelia* has been called *pygmaea* Duf., but Horváth (11) has pointed out that *M. pygmaea* belongs rather to the south of Europe, and that our species is really *M. reticulata* Burm., which replaces *M. pygmaea* in more northern latitudes. It occurs in Europe generally, extending its area farther north than the true *M. pygmaea* which belongs to Central and Southern Europe. In Asia its place is taken by large numbers of allied species. The tanks of India sometimes swarm with these; they are often fully winged and then frequently come to light. In Britain *M. reticulata* has been found in all the coast counties from Northumberland to Devon, except Durham, as well as in Cumberland, Cambs, Warwick, Worcester, Somerset, Glo'ster, Oxon, Berks, and Surrey. The only Welsh record is from Glamorgan. It has occurred in both Scotland and Ireland.

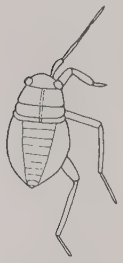
168. **Velia currens** Fabr.

Fab., E.S. iv, 193, 22 (1794); D. & S., B.H. 571 (1865); Saund., H.H.B.I. 149 (1892).

Ova. Similar to those of *Gerris lacustris* (q.v.), but smaller. Leuckart says: "Instead of a single micropylar canal, there are two, at a little distance from one another and proceeding from the same depression; the course of these canals is somewhat divergent, but much less strikingly so than in *Gerris*, which agrees with this egg in other respects notwithstanding its greater thinness."

Larvae. An early instar, probably the first, 1 mm. long. Body obovate, black, strongly pilose; hairs on head longest; a semicircular reddish impressed line on head, passing up between eyes, which also are reddish; pronotum much the largest of the thoracic tergites; legs and antennae deep brown; antennae four-jointed, tarsi one-jointed; intermediate legs longest.

A later instar, probably the next, 1½ mm. Body broad oval; integument very shining, but pilose; beginning of connexivum, which is reddish brown; fore parts of body tinged with rufous, with a central pale line; a central impressed line to the head, glabrous; small silvery patches just within the connexivum; legs and antennae as before.


Intermediate larva of *Velia currens* F.

A later instar, 3 mm. Body longer oval, connexivum broader and sometimes darker, central line broader and paler; integument very shining; mesonotum larger, rest as before.

A later instar, about 5 mm. Genital segments plainly differentiated; connexivum more yellowish and more raised; pronotum transverse, with concave anterior margin and convex posterior; two foveae on disc at sides, with traces of silvery pubescence; on vertex of head, two glabrous comma-shaped spaces; pale central line very fine on pronotum, enlarged into a broad reddish-yellow patch on metanotum, continued as a fine line on first two segments of abdomen; antennae proportionately thinner.

Final instar. Pale central line running down the dorsum of the abdomen and terminating in a round spot on the first genital segment; the connexivum of the sixth abdominal segment ends in a projecting point; legs and antennae proportionately thinner. The imago escapes through a fissure made along the central line of pro- and mesonotum, the integument of the head being separated along the inner margin of the eyes, and pushed forward.

Life-cycle. It will be seen from above that at least five larval instars can be recognised and these are probably all. The first of them were taken at the beginning of June, and the latest during the early part of August. It would therefore appear likely that the eggs are laid in May; the insect develops during the summer months and becomes mature in August. I have, however, on one occasion, found very young larvae at the beginning of April, and also at the end of August. Some specimens of the imago exist concurrently with the larvae in summer, and I have records of the occurrence of the imago from February to September, and also in November. It passes through the winter as an imago, in moss covering the stones of its watercourse. Kuhlgatz says it has several generations in a year, which the above observations confirm.

Habitat, etc. This species lives on running water, though it is occasionally found on ponds. In Ireland the Rev. W. F. Johnson found specimens on a boggy pond and in a disused quarry. In neither of these cases was there at the time any outlet, though in wet weather the rise of the water would give one. He also found it on Lough Neagh round an island, where there was no current or movement other than that caused by the wind. It is also found hiding under stones near the waters, especially in watercourses. In Scotland, Kirkaldy found many specimens under stones, often two or three yards away from the water, and I have found it similarly in Sussex and Yorkshire. It is always gregarious, occurring in small companies, which are often very crowded together. On the water it moves the legs of the two sides alternately like *Microvelia*, and not simultaneously, as *Gerris* does. As it is always found on the water itself, instead of on the pond weeds, its movements have a fussy appearance, and it seems to be perpetually struggling against adverse forces. The insects delight to congregate round any fixed object in the water that will keep them steady against the current, and they often hug the shore. When their stream is nearly dried up, they may be found in numbers taking refuge under the boulders in its bed, even if these are quite out of the water.

Like the rest of the water-bugs, it is carnivorous, although the occasions are not numerous on which it has been seen actually feeding. Probably much of this is done at night. Morley found a specimen sucking a dead Trichopteron in March. This suggests that the prey may consist of insects disabled by falling into the water, or actually drowned, rather than of living prey captured by itself.

The insect is dimorphous, having apterous and winged forms in both sexes. As a rule the winged forms are rare, but occasionally they occur in some numbers in particular places. This has been notably the case on a piece of water at the town of Carmarthen, called Pondside. It is really a stream which was formerly utilised to supply water-power to some tin-works. For this purpose it was embanked, so that it now runs at a level, on one side, considerably above that of the fields it passes through, while on the other the land rises abruptly till the level of the road is reached. The stream runs pretty much east and west, and the exposed side faces the south, so that it gets all the benefit of the midday sun. Possibly these peculiar conditions may have something to do with the large proportion of developed examples that I have found there on the only two occasions on which I have examined it. The first occasion was in the year 1906, in the month of August, when I got eight macropterous specimens and found also a pair of detached hemielytra floating on the water, which represented a ninth. The next occasion was in August, 1909, when also I obtained six specimens. Several of these on each occasion had evidently only just matured and were still teneral. In other localities I have never found the developed form except singly and occasionally. J. C. Dale, however, found a considerable number at Glanvilles Wootton.

The question arises whether all the above specimens were really *V. currens*, since there occurs on the Continent what is usually reckoned as a distinct species, *V. rivulorum* F., and this is generally macropterous. If these two are really distinct, they are certainly very closely allied, and it is difficult to find perfectly reliable characters for their separation. Puton relies upon the following points : *V. currens* is a smaller insect, which has upon the sides of the abdomen an uninterrupted black band, while *V. rivulorum* has a set of distinct and separate black spots ; *V. currens* has the pronotum and legs blacker than *V. rivulorum* and the dorsum of the abdomen with the last three segments brown instead of red ; and lastly *V. currens* has the middle white spot on the hemielytra oval instead of round as it is in *V. rivulorum*. It will be seen, therefore, that, apart from the size, there is no structural point included here, and the distinction is made to depend upon colour alone ; in fact Puton himself had great doubts as to the distinctness of the two, as he plainly indicates in a footnote. The difference in length is that of one millimetre only, *V. rivulorum* being given as 8 mm. while *V. currens* is 7 mm. If now we test our British specimens according to these criteria, we find a somewhat perplexing result. My own collection now contains seventeen macropterous examples ; none of these are over 7 mm. in length, and most are hardly more than six, and thus far one would naturally suppose them all to be *V. currens*. As regards the lateral bands, two of them have distinct spots, one has the band almost entirely absent, there being only traces of it at the beginning, and the rest have what might perhaps at the base be described as a band, but it tails off sooner or later into more or less separate spots ; the impression made by the whole series is that it is merely a question of varying degrees of development of black pigment in a common pattern, rather than a distinctness of pattern. Similarly as regards the white spot on the hemielytra ; in all except two it is oval, and in those two it is round, but the size varies as well as the degree of ellipticity. So with regard to the colour of the pronotum and legs ; in some the pronotum is almost black and in others it is more or less reddish, while the legs seem to be about equally black in all. Mr. Champion has seven specimens which I have been able to examine ; three of these are more ferruginous than any of mine ; in the three ♂♂ the lateral band consists of small separate dark spots ; in the ♀♀ there is a more or less continuous band.

In the above circumstances, one cannot help being rather sceptical as to the value of these so-called species. One of my specimens is, I believe, what would on the Continent be called *V. rivulorum*. It is said that *V. rivulorum* is generally macropterous, while *V. currens* is generally apterous. From this point of view there is no doubt that our species is in most places *V. currens*. But it is not easy to say what proportion constitutes " generally" in any set of captures one may make. The proportion of macropterous specimens, for example, in my Carmarthen experiences was far higher than it usually is, but whether high enough to bring it under *V. rivulorum* who shall say ?

In popular literature this insect is usually called the " Water Cricket."

According to Miall, it can be seen at times to run, back downwards, on the surface-film, completely immersed in the water ; its abdomen at such times glistens with the air-film which overspreads it. This is after the fashion of a Hydrophilid beetle.

Distribution. The area of *V. currens* extends over Europe and into Turkestan ; the insect occurs also in Algeria and the Canary Islands, and in the Oriental Region. In Britain it appears to be the most widely distributed of our water-bugs ; it is included in all the county lists I have seen, i.e. for thirty-four English counties ; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan. It is found also in Scotland and Ireland, and Reuter records it from the Shetland Isles. The macropterous specimens are not confined to any one district ; my own are from Sussex, Surrey, Yorks, and Carmarthen ; Champion's from the London district and Devon. Saunders gives in addition, Lincs, Norfolk, Hants, Dorset, Glamorgan, Scotland, Ireland, and Morley records one from Suffolk. In " Loudon's Magazine of Natural History " for 1831, both *V. currens* and *rivulorum* are recorded as taken November 15th, 1830 (A. Wright). This may, of course, mean an apterous and a macropterous specimen of *V. currens.* The Scottish record is given by Curtis, who took several specimens in a small spring surrounded with rushes, at a considerable height on the Ochill Hills, near Stirling. There are thus far no records from Westmorland, Salop, Hunts, Beds, Northants, and Monmouth, amongst English counties.

Sub-family V. **Gerridina.**

This sub-family contains some of the most highly specialised insects amongst the Hemiptera. Their extraordinary structure fits them in a remarkable degree for their life on the surface of large sheets of water, and renders them most awkward under any other conditions. Our own fauna does not contain the most remarkable species, viz. those in which the body is reduced to the smallest proportions, and which are inhabitants of the open sea, an extraordinary and quite exceptional habitat for insects. We have only one of the seven Palaearctic genera, but it is by far the most important one, as it contains more than two-thirds of the Palaearctic species. To the ordinary lover of the country these insects are probably the most familiar of all the Heteroptera ; they are an essential element in any picture of aquatic life. Popularly known as pond-skaters or water-measurers, they attract the attention of even the least observant by the free and easy way in which they dart along over the surface of the water, and the agility and wariness with which they elude and seem to defy efforts at capture. As the method of the movement of all the species is the same, it will save repetition if a description of it is given here once for all.

As the insect sits upon the water, the body does not really touch the surface, but only the legs. This can be shown by watching the shadow cast by the insect in bright sunlight upon a sandy bottom in shallow water. The legs do not actually break the surface film, but they slightly depress it where they come in contact with it, as can be seen in the bright light by the circles that surround the points of contact. These little depressions cast shadows upon the bottom, each again surrounded by a bright ring, which is due to the refraction of the rays of light that pass through the curved surface. Now the shadow cast by the body of the insect is not so accompanied by rings of light, and the inference is, of course, that it is acting merely as a dark object above the water, and does not actually touch the surface (Miall). The fore legs merely rest in an upright position with their tarsi on the surface, and are at liberty for the seizure of prey ; the chief organs of locomotion are the intermediate pair, which are together violently struck backwards along the surface, thus causing the insect to shoot violently forwards. They are always longer than the posterior legs, and thus their sweep is not impeded by these latter, which are used mainly as rudders for steering purposes. With the larger species a wide area is covered by the sweep of the legs, and the force of the blow is such as to give at each stroke a high velocity which enables the insect to cover a long distance before its momentum is expended. The smaller species need to use more frequent strokes and their velocity is not so great. This, however, is not the only method of locomotion possessed by the insect. Meinert has pointed out that a *Gerris* has at its disposal three ways of moving over the water. Like all other objects on the surface, they can simply lie and float or drift about under the influence of winds or currents ; then, secondly, there is the skating method already described, and finally there is a method resorted to under the influence of a sudden alarm, when the insect takes rapid and violent leaps along the water, which soon carry it out of harm's way. If the insects are brought ashore, this leaping method is the only one they can adopt, for the legs must be moved, each pair simultaneously ; they seem quite unable to be used otherwise. The insects are thus very awkward on land, especially if amongst vegetation or on an uneven surface, and they always try to regain the water as soon as possible ; once there, they feel themselves safe. They are extremely wary, and very agile, so that capturing them is not an easy task and requires a sure and rapid stroke of the net.

There is a curious point in the structure of the thorax, that the pronotum is posteriorly prolonged into a rounded plate which overlaps almost the whole of the greatly elongated mesonotum, though it is not attached to this, but merely overlies it. There is nothing unusual in this relation of the pronotal shield to the mesonotum ; it is what holds good of the Heteroptera generally ; but what is remarkable is the great elongation of these parts backward, which is found only in this sub-family.

The Gerridina are all carnivorous, and use the fore limbs for seizing and holding the prey, while the short rostrum is brought into position and plunged into it. De Geer describes them as capturing and holding living prey. Miall, however, throws some doubt on this, saying that, in his view, *Gerris* is timid and prefers a victim which is dead or nearly so. Many such are, of course, always to be found on the surface of ponds. Several authors have stated that *Gerris* occasionally dives, but as this, for an insect so constructed, must be a difficult process, it must surely be very seldom resorted to ; it is far too difficult to be relied on for escape from danger. The authority for this habit is ultimately Brullé.

According to Bordas, the salivary glands in these insects are extremely large, occupying a large part of the thorax. There is, as a rule, much more yellow in the coloration of the larvae than of the adults. According to Fabricius their eggs are parasitised by a small Hymenopteron of the genus *Teleas*.

The Gerridina are very widely distributed, and all the species are gregarious. Dufour gives the following description of the eggs : " Les œufs des *Gerris* sont allongés, cylindroïdes, non tronqués à l'un de leurs bouts. Au lieu de s'ouvrir par le décollement, la chute d'un opercule régulier, comme cela a lieu pour la plupart des Géocorises ils se fendent, ou peut-être ils se déchirent longitudinalement dans leur tiers antérieure, et c'est par cette fente que sort la larve." In this respect they resemble the *Berytidae*. According to an American author, O. Lugger, the eggs are attached to the leaves and stems of aquatic plants. They hatch in about a fortnight.

169. **Gerris rufoscutellatus** Ltr. (subg. Limnoporus Stål.).

Latr. Gen. Cr. Ins., iii, 134 (1807) ; Saund., H.H.B.I. 153 (1892).

Ova and **Larvae.** Not described.

Life-cycle. In Britain the imago has been found in March and April, and on the Continent from March to September.

Habitat, etc. It lives on ponds, skating over the surface.

The insect described under this name in Curtis's "British Entomology" is *G. thoracicus* Schumm.

Distribution. This is an insect of very wide distribution, being found all over Europe ; in Asia it occurs in Turkestan and Siberia, and it extends also into the Nearctic Region, being found in Alaska, Canada, and the Northern States. In Lapland it reaches the parallel of 67°. Bueno considers it the most widely distributed of all Heteroptera, except *Nezara viridula*. In Britain it is our rarest species, and has been found only in the five English counties of Cumberland, Norfolk, Suffolk, Surrey, and Sussex, as well as at Pitlochry, Scotland. Judging from the English records it occurs here either singly, or in quite small numbers, instead of in large companies, as the other species do.

170. **Gerris paludum** Fab. (subg. Hygrotrechus).

Fab., E.S., iv, 188, 2 (1794) ; D. & S., B.H. 559 (1865) ; Saund., H.H.B.I. 154 (1892).

Ova. According to Dufour, the eggs are elongate-cylindrical, and not truncated at one end. On hatching, there is no removal of a definite cap, but the covering of the egg splits longitudinally in its anterior third, and it is out of the orifice so made that the young insect emerges. (Hungerford describes American species as having a black egg-opener.) The method is, therefore, similar to what I have previously described as taking place in the genus *Berytus* (q.v.). The eggs are laid sporadically one after another, neither touching one another in line, nor in masses, but in a kind of mucilage on the stems of submerged plants.

Larvae. After the larva has emerged from the egg as above, there is seen projecting from the opening a delicate membrane, and in this respect again there is a resemblance to *Berytus* (q.v.). In its later stages, the larva is very much like the adult, the principal differences, apart from the smaller size, being the softer nature of the integument, the presence of wing-pads, the absence of the two spines at the end of the connexivum, and the presence of only one tarsal joint instead of two. Judging from the number of cast skins lying on the surface of the water, the ecdysis would appear to take place either actually on the open water, or on the surface near shore. The cast skins are extremely perfect and often show clearly points of structure that are obscure in the insect itself. For example, in the cast skin it is easy to see that the vestiture of the intermediate and posterior femora consists of two elements, a number of short stout black spinous hairs which are found chiefly on the under (or more correctly, posterior) surface, and a soft pile which is distributed equally all over. On the anterior pair, the soft pile only is found. This is no doubt connected with the fact that the anterior pair are not used for swimming, or rather skating; in the true skating legs the side which has the spines is that which is forcibly driven against the water, and the spines would probably give a better support to the layer of air which is entangled amongst the ordinary pile, and prevent the force of the blow from dissipating it, thus preserving the legs from a wetting, which would hamper their movements by reason of the surface tension which would then be brought into play upon them. These cast skins are deeply coloured in the fore parts, the head being almost as dark as in the insect itself; the legs are deep blackish-brown, and the antennae are as deeply pigmented as those of the actual insect; while the skin of the eyes is perfectly clear and transparent, showing all the facets beautifully.

Life-cycle. The adult has been found from April to October; the insects of the year mature about August, so that those found in spring are probably over-wintered specimens.

Habitat, etc. This species occurs on large ponds or lakes, skating over the surface with very great vigour and power. It is gregarious, and is often present in large numbers. When alarmed, it resorts to the method of leaping along the surface previously described. In windy weather it is apt to lie under the shelter of the banks, though at other times it will venture far out on the water. It is always fully winged, at least, in Britain; Puton says that examples have been found in France with the hemielytra extending only half-way down the abdomen.

Distribution. This species is not so widely spread as the preceding, although much commoner in our own country. It occurs over Northern and Central Europe; it also passes into Turkestan and Siberia. It has been recorded from eight English counties, viz. Durham, Staffs, Derby, Kent, Surrey, Sussex, Berks, and Hants, from Glamorgan in Wales and from the North of Ireland. Its chief home appears to be the compact area of the five counties south of the Thames from Berks and Hants to Kent.

171. **Gerris najas** De G. (subg. Hygrotrechus).

De G. Mem., iii, 313, t. 16, fig. 9 (1773) ; D. & S., B.H. 560 (1865) ; Saund., H.H.B.I. 154 (1892).

Ova. Undescribed.

Larvae. In the larvae of whatever age, there is no great development of the pronotal shield which in the adult covers so large a part of the mesonotum ; in fact, the mesonotum is the thoracic segment which is most highly developed. In an intermediate instar, measuring 6 mm. in length, the pronotum is simply transverse and comparatively small, trapezoidal and narrowest behind ; mesonotum much larger and longer, with three yellow marks upon it, two placed diagonally and diverging behind, and the third longitudinal and placed between them ; two yellow lines on the metanotum, and two yellow spots on the first abdominal segment ; the greater part of the underside yellow, with brown marks on the intermediate coxae and their acetabula ; head yellow in front and round inner margin of eyes.

Last instar, 10–11 mm. The pronotum now has a crescent-shaped projection from its hind margin, which is the initial stage of the large shield, which will appear after the next moult ; the yellow markings of the mesonotum may still be seen, but less distinct ; of course they will be altogether concealed when the pronotal shield attains its full development, so as to cover them ; tarsi one-jointed, and no ocelli. In the adult, the greater part of the yellow coloration disappears except in the region of the coxae.

Life-cycle. The imago has been found in the open from March to October. The insects of the year mature in August ; at the beginning of the month most of the examples are larval, but by the end practically all are imagines. Pairing takes place in April. The small ♂ rides for a long time on the back of the much larger ♀, though not actually copulated, and they allow themselves to be captured in this position without breaking the association. Of course, in these circumstances the ♀ completely carries her mate, and does the whole of the locomotion. A species of *Microvelia* in India has the same habit. The ♂ clings to her by his fore legs, and of course, in this position, as he is much the smaller insect, the end of his abdomen is considerably in advance of that of his partner, so that the aedeagus has to be thrust out for some distance. De Geer says that he has never seen male insects more ardent in their amours than this species, and that sometimes his partner seems to get weary of his perpetual attentions, and so tries, in a variety of ways, but apparently unsuccessfully, to dislodge him. The eggs are said to be laid in July, but this seems far too long after copulation, and certainly does not leave time for the insect to become mature during August. It is much more probable that they are laid in May. It is not easy to say what becomes of such large and conspicuous insects in the winter, so that for four months there is no record of their having been observed in the open.

Habitat, etc. Unlike the preceding, this species inhabits running water, rivers, dykes, canals, etc. It is dimorphous, there being both an apterous and a fully winged form in both sexes, of which the former is far the commoner; in fact the winged form has very seldom been taken in Britain. Flor gives out of a total of 82 specimens before him when he wrote, 77 apterous to 5 winged, and this is probably a considerably larger proportion than obtains in nature, at least in our own country, for Douglas and Scott record finding no winged specimens amongst hundreds of examples taken. Sahlberg gives the following description of the macropterous form: "hemielytris fumatis, costis crassis nigris, fulvo-puberulis, apicem segmenti quinti abdominis attingentibus, alis his parum brevioribus; thorace crassiore, pronoto magis declivi, tuberculis humeralibus distinctis."

The gravid ♀ has the abdomen greatly distended, and it then reveals an elevated ochreous ridge on each side of the dorsum, making it look like a different species. This ridge consists of the membrane which joins the tergites to the connexivum, and which, as the connexivum closely abuts on the dorsum, is usually concealed but is now pushed out of position by the growing ova.

This species was found by Parfitt in salt water ditches as well as in fresh.

These insects seem to delight to place themselves in opposition to the current of the water on which they live, and to struggle against it.

Distribution. It is found throughout the greater part of Europe, and extends into Algeria and Morocco on the African coast. It has been taken as far north as 62° 40′. In Britain it is recorded from all the counties on the East coast except Norfolk, from all on the South coast, from Cumberland, Cheshire, and Somerset on the West coast, and from the inland counties of Westmorland, Leicester, Cambs, Warwick, Bucks, Herts, Middlesex, Surrey, Berks, Wilts; it also appears in the lists for four Welsh counties, Denbigh, Carnarvon, Carmarthen, and Glamorgan. It is found in Ireland, but has not yet been recorded from Scotland. It is abundant on Windermere, where the current is strong. Whittaker records two winged examples taken in Cheshire in September, 1905.

172. **Gerris lateralis,** v. **costae** H.S. (=G. costae Osh Cat.).

H.S. Wanz. Ins., ix, 71 (1853); Saund., H.H.B.I. 154 (1892) (costae).

Ova. Unknown.

Larvae. In the last instar, 8 mm., the anterior part of the pronotum and the wing-pads are very shiny, and the rest of the body more or less dull; the whole is covered with a very short golden pubescence. On the head are two faint yellow lines, one just within each eye and a small central one and two lateral spots just above the clypeus; the prolongation of the pronotum is more or less reddish in its terminal portion. The anterior tarsi, as usual, are one-jointed, but the intermediate and posterior ones are two-jointed.

Life-cycle. So far as Britain is concerned, the imago has been found from April till August, but there are no records as to the earlier stages, save that I have found the larva in its last instar as late as August.

Habitat, etc. This species is subalpine, occurring chiefly on mountain lakes, pools, and ditches. It is found also on pools in moorland tracts in the North of England.

Saunders, in his "Hem.-Het. Br. Is.," treats this insect as a var. of *G. lateralis* Schum. In the Catalogues of Puton and Lethierry and Sévérin, on the other land, *G. lateralis* is treated as a var. of *G. costae*, but in Oshanin's Catalogue, the most recent, *G. lateralis* and *G. costae* are given as distinct species. *G. lateralis* does not occur with us, and in fact is recorded only from Germany, Austria, Rumania, and the Caucasus. *G. lateralis* is a little broader than *G. costae* and has the abdomen above and below more or less yellowish, and the yellow lateral line of the pronotum continued to the front.

Distribution. *G. costae* occurs throughout Central and Southern Europe and in Asia Minor and Turkestan. In Britain it is distinctly a northern species and occurs chiefly in Scotland, where it is abundant; but it has been taken also in Northumberland, Cumberland, Durham, Lancs, N.E.Yorks, Derby, and in N. Wales; there is a record also for Essex. It occurs also in the Hebrides and the Orkneys, and in Ireland.

173. **Gerris thoracicus** Schum.

Schum. Beitr., 2, 46, 8 (1832); D. & S., B.H. 562 (1865); Saund., H.H.B.I. 155 (1892).

Ova and **Larvae.** Not described.

Life-cycle. This species is most abundant in spring and early summer. The imago occurs from March to September and is commonest from May to July; there are no records bearing upon the earlier stages.

Habitat, etc. *G. thoracicus* is found on the surface of ponds, and on slowly running streams. Morley states that it often occurs on brackish water in Suffolk. Its habits are similar to those of the other pond-loving species. Kirkaldy reports its having been captured at light.

Distribution. This is one of the most widely distributed species, occurring almost throughout Europe. It inhabits also the Canary and Balearic Islands, and Cyprus, as well as Tunisia, Turkestan, and Siberia. In England it is recorded from all the counties on the East and South coasts, and also from Cumberland, Lancs, Cheshire, Notts, Leicester, Cambs, Warwick, Monmouth, Oxon, Middlesex, Surrey, Berks, Wilts, and Somerset; the only Welsh records are from Flint and Glamorgan; it is found in both Scotland and Ireland.

174. **Gerris asper** Fieb.

Fieb. Eur. Hem., 108 (1861); Saund., H.H.B.I. 155 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. Very little is known about this species, and the only records for the imago are in March, August, and October.

Habitat, etc. This insect is dimorphous, having both a macropterous and an apterous form. Sahlberg thus describes the apterous form: "hemielytris alisque nullis, thorace minus crasso, pronoto subplano, tuberculis humeralibus nullis." Norman says that nearly all of those taken at Pitlochry were apterous.

Distribution. This species inhabits Europe generally, Morocco and Siberia, and in Lapland reaches the parallel of 69°. With us it is almost exclusively a northern species, having been recorded chiefly from Scotland; the only exceptions I know of are a few specimens taken by Mr. G. E. Hutchinson at Holt, Norfolk, in March, 1918, and a specimen in my own collection which is, I believe, from south of the Tweed, though I am not sure of the exact locality. It is one of our rarer species.

175. **Gerris gibbifer** Schum.

Schum. Beitr., 2, 41, 6, t. 3, figs. 5–7 (1832); D. & S., B.H. 564 (1865); Saund., H.H.B.I. 156 (1892).

Ova and **Larvae.** Common as this insect is, I have no information with regard to either eggs or larvae.

Life-cycle. The imago occurs in the open from March to October.

Habitat, etc. This species is an inhabitant of ponds and ditches. According to Morley it is found in Suffolk occasionally on brackish water. Collins reports it from the Thames and a canal. Like the rest of the genus, it is carnivorous, and Morley records finding one on a moat at Monks Soham, holding an example of the saw-fly *Tenthredo balteatus* Klug ♂, which it was sucking while skimming over the surface. Blathwayt says: "I have frequently found it with its colour changed from black velvet to brilliant scarlet by the number of parasites that had fastened themselves to it." These parasites would be the larvae of *Hydrachnidae*, or water-mites.

Distribution. It occurs in Central and Southern Europe, and the South of Russia, as well as on the north coast of Africa towards the western end of the Mediterranean, but it does not appear to extend so far northward as 55° N. lat. In England, it is widely distributed, being recorded from all the coast counties from Durham round to Glo'ster, as well as from Cumberland, Lancs, Cheshire, Notts, Oxon, Surrey, and Berks; from Wales come records from Carmarthen and Glamorgan. I have seen two specimens from the South of Scotland, but it has not been found in Ireland.

176. Gerris lacustris L.

Lin., F.S. 970 (1761); D. & S., B.H. 566 (1865); Saund., H.H.B.I. 156 (1892).

Ova. Leuckart gives the following description: "*Gerris lacustris* has large, oval, yellow eggs like *Notonecta*, except that the difference between the upper and under surfaces is not so clearly marked. The chorion is simple, but very thick and strong, especially at the poles. The upper surface shows numerous irregularities, prominences, and pores. The micropylar apparatus consists of a single minute but plainly marked canal, which proceeds from a shallow cavity at the anterior pole, and runs back in an oblique direction so that its opening does not quite fall into the pole of the egg. The lower end of the micropylar canal describes a sharp inwardly directed bend a short distance before its opening.

Larvae. The larva, in general form, is similar to the adult, but the abdomen is very short, extending, in the earliest instars, only a very little beyond the posterior coxae; its length gradually increases in the later instars, but is never more than a small fraction of its length in the adult. The tarsi are composed of one joint only. The whole of the upper surface is shining with the exception of the head, the anterior part of the pronotum, and the terminal part of its posterior prolongation. On the head is a central longitudinal yellow line and sometimes two yellow spots on each side of it; this line is continued finely through the pronotum; the base of the scutellum has four elongate triangular yellow streaks, and the apex of the dull part has two yellow spots. In the younger instars the connexivum has a row of yellow spots, but these seem to disappear in the older ones. The base of the fore femora is more or less yellow, as well as the softer parts of the underside. In the latest instar, the wing-pads reach almost to the end of the abdomen.

1st instar, $\frac{3}{4}$ mm. Body short oval, dark brown; head large, triangular; some abdominal segments with a few silvery hairs on each side; fore and intermediate femora and fore tibiae brownish ochreous; intermediate tibiae and hind legs brownish-black; all tarsi black; antennae brownish-black, last joint longest and thickest, black.

Life-cycle. The adult is probably to be found more or less all the year round. I have records for all the months from February to October, and in the early spring, the specimens are often seen to be more or less coated with mud, suggesting that they have spent the winter in some subterranean abode. Such hiding-places, however, are not necessarily in the vicinity of the pond it has inhabited during the rest of the year, for Douglas found a specimen in March in long, damp moss growing under the shelter of a furze bush on the northern side of a hillock, and half a mile away from the nearest water. To reach such a spot, one would suppose that it must have flown, as its movements on land are so extremely awkward and uncertain, that it is difficult to understand how otherwise such a situation could have been reached. The young appear about June and are fully grown, as a rule, by August.

Larvae are found only in the summer months and hence the spring specimens must be over-wintered examples. In the year 1913, in Herefordshire, I found most of the specimens larval in August, some of them quite young, and only a very few adults, but this was somewhat unusual, and in the same month, 1915, I found, on a wayside pond in Bucks, many evidently only just hatched. Such records suggest that batches are produced at different times during the summer, but it does not follow that the later ones are the posterity of the earlier, and therefore are not strictly speaking "generations."

Habitat, etc. This is by far the commonest species of the genus, and is a very general inhabitant of ponds and wet ditches. Curtis (*G. variabilis*) says: "Taken on salt water ditches I believe on the coast of Suffolk in August." Parfitt confirms its occurrence on brackish water as well as fresh. I have received a specimen from Mr. Stenton which was taken in the sea close by the shore, half a mile from the mouth of the river Arun, near Littlehampton, Sussex; this must apparently have been carried from the river by the strength of its current out to sea, where it found itself unable to contend against the tide and regain the fresh water. If that be so, its power of resistance to the salinity of the water is far greater than that of most insects. According to Flor, it is found on running as well as stagnant water.

This species has both brachypterous and macropterous forms. But in brachyptery there are many degrees of development. I have one specimen which shows the merest rudiments of the hemielytra, their apex only slightly overlapping the base of the metathorax, and leaving the whole of the abdomen bare. This specimen is a ♀. But, to judge from my own collection, the majority of the brachypterous forms are ♂♂; I have only one other brachypterous ♀, to six ♂♂. In these latter the hemielytra extend to various distances, from the end of the third to some distance beyond the beginning of the fifth segment. These brachypterous forms have the thorax narrower than those which have their alary apparatus fully developed, in accordance with an inferior development of the muscles of flight. They were all taken in spring, in either March or May; it follows therefore that both sexes hibernate, and pairing takes place in the early summer. In this species macroptery is far commoner than brachyptery.

Sahlberg gives the following description of the brachypterous form: "hemielytris angustis, apicem segmenti quarti dorsalis vix attingentibus, apice divaricatim angustatis, alis nullis; thorace minus crasso, pronoto supra deplanato, tuberculis humeralibus obsoletioribus."

Distribution. This insect is distributed over the whole of the Palaearctic Region. In Britain it is contained in the lists from thirty-three English counties, i.e. from all except Staffs, Derby, Hunts, Beds, Salop, Northants, and Monmouth; in Wales it is recorded from the counties of Carnarvon, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland.

177. **Gerris argentatus** Schum.

Schum. Beitr., 2, 49, 9 (1832); D. & S., B.H. 568 (1865); Saund., H.H.B.I. 157 (1892).

Ova. Unknown.

Larvae. In its last instar, 5 mm., the larva differs from the other species of the genus chiefly in the very shining appearance of the upper surface, except the abdomen; the colour is mainly black, but there is a yellow spot on each side in the connexivum of each segment, and in life these have a silvery sheen. The head shows very faintly a couple of yellow lines branching from the centre of the vertex and running down by the eyes, and the extreme posterior margin of the head, where it is overlapped by the pronotum, is more or less reddish-yellow; sometimes also there are reddish streaks at the base of the pronotal process; underside of head, prosternum, meso- and metapleurae yellow, rest of body more or less whitish beneath. In other respects it resembles the other species. The short posterior tibiae and tarsi help to distinguish it from *G. lacustris*.

Life-cycle. I have records for the occurrence of the adult in every month in the year except January and November. The lack of records for these two months is probably due to lack of opportunity for investigation. There can be little doubt, therefore, that the insect exists in the adult condition all the year round, though the specimens found in the later months do not belong to the same brood as those in the earlier months of the same year. It matures towards the end of July or the beginning of August. The July record for the adult is a continental one, and I have not met with any mature specimens in that month in our own country. Probably, therefore, the duration of the life of the most hardy specimens, at least of the ♀♀, is from the August of one year to about the beginning of July in the next year, in which case the mothers would not have the pleasure of witnessing the maturation of their brood, though they would be familiar with the early stages. Doubtless the winter months are spent in retirement; the above record for December is from Rev. W. F. Johnson, who found a specimen in flood rubbish. Both temperature and scarcity of food would probably prompt such a retirement.

Habitat, etc. This insect frequents ponds, and is sometimes found in company with the larger species; e.g. I have found it in some numbers in company with *G. paludum*, which also was plentiful. At times, again, it seems to monopolize a pond. The ponds that collect in brick-pits are specially attractive to water-bugs, both *Gerridae* and *Cryptocerata*. J. E. Mason records this species from such localities. Collins reports it from the river Cherwell. It appears to be always macropterous.

Distribution. It is of general occurrence throughout Europe, and extends into Asia, being reported from Turkestan, and is also found in Morocco. In England also it is widely distributed, being recorded from the coast counties ranging from Durham to Cornwall, and from Cheshire, Cambs, Hunts, Warwick, Oxon, Surrey, and Berks. There are at present neither Welsh nor Scottish records, but it has been found, as mentioned above, in Ireland. Thus its most northerly occurrence in Great Britain is in Durham.

178. **Gerris odontogaster** Zett.

Zett. Faun. Ins. Lap. i, 506, 3 (1828) ; Saund ; H.H.B.I. 157 (1892).

Ova and **Larvae.** I have no knowledge of either of these.

Life-cycle. The perfect insect occurs in the open from March to October.

Habitat, etc. This is another inhabitant of ponds, and I have found it in company with *G. paludum* and *G. argentatus* on a comparatively small, but sheltered, pond. Like *G. lacustris*, to which it is closely allied, it is dimorphous, and the brachypterous form appears to be much the rarer ; my only specimens are two ♂♂, both taken in August on a pond near Maidenhead. These have the hemielytra quite rudimentary.

Reuter gives the following description of the brachypterous form : " Hemielytris brevissimis, basin segmenti secundi dorsalis vix attingentibus, apice singulatim rotundatis, alis nullis, pronoto subdepresso, tuberculis humeralibus distinctis, sed vix elevatis." Superficially it might easily be mistaken for *G. lacustris*, but the teeth under the abdomen of the ♂ and the darker fore femora in both sexes should easily prevent that.

Distribution. It occurs throughout Northern and Central Europe, including the whole of Russia, and extends into Siberia, but it is not recorded from the southern peninsulas. In Britain it is much less common than *G. lacustris*, but still is widely distributed ; the records indicate a more sporadic distribution than that of either *G. lacustris* or *argentatus*, but this may not improbably be due to its being overlooked on account of its strong resemblance to *G. lacustris*. The records are from the coast counties extending from Northumberland to Sussex, except Suffolk, and also from Cumberland, Lancs, Cheshire, Notts, Cambs, Warwick, Hereford, Oxon, Herts, Surrey, Berks, and Cornwall in England ; from Carnarvon in Wales, and from both Scotland and Ireland. Thus the largest continuous areas inhabited by it are in the N. and the S.E. of England.

Family X. **REDUVIIDAE.**

This is an enormous family of terrestrial and highly rapacious Hemiptera, which is very poorly represented in our Fauna, eleven out of our paltry total of eighteen species belonging to one genus alone. For the Palaearctic Region as a whole about three hundred species have been described, but even this is far below the immense variety that characterises the tropics.

The species are highly carnivorous and feed upon living prey, as is indicated by the raptorial character of their fore legs and the short and very strong rostrum. The majority are of considerable size; none are very small, and many are very brilliantly coloured, especially with reds and yellows. Very many are provided with an armature of spines on head or thorax or both, and some carry them on legs as well. Many, again, are very hairy, and in all cases the antennae are thin and filiform. The rostrum does not fit in a groove on the underside, as is generally the case in other families, but its tip rests upon a more or less distinct furrow on the prosternum between the coxae of the anterior legs. This furrow is often transversely striate in a very regular fashion, and a distinct stridulation is capable of being produced by rubbing the tip of the rostrum over these striae so that it crosses them at right angles. In the "Annalen" of the Vienna Natural History Museum for 1900, Prof. Handlirsch describes and figures the stridulating organs in two of our British species, viz. *Reduvius personatus* L. and *Coranus subapterus* De G., and he calls attention to the fact that a similar furrow is to be found in almost all sections of the *Reduviidae* except the *Nabidina;* he enumerates ninety genera in which he has observed it, but whether in all these cases the furrow is transversely striate, and therefore, presumably, a stridulating apparatus, he does not state. Further particulars of this structure will be given under the head of the different species.

According to Kirkaldy (9), the eggs are deposited on the surface of leaves and have ornamented caps of noteworthy form.

Some of the larvae have the curious habit of covering themselves with particles of dust, grains of sand and other rubbish, whereby they are considerably disguised, so far as their generic or even ordinal relations are concerned, though still of course generally recognisable as insects. Whether such a camouflage facilitates their approach to their prey is difficult to say, and yet it is not clear what other purpose can be served by it, unless it be to preserve them from the attacks of birds or lizards. Mr. G. Arrow once told me that he considered that these devices were intended to deceive vertebrate, but not invertebrate eyes.

The majority of the species live on the ground, but a few are found on trees and plants, where, no doubt, they congregate for the sake of the insect prey to be found there.

It is curious that, notwithstanding their rapacious habits, they do not, as a rule, exhibit the robustness and strength of armature which one would naturally expect in a predatory insect; the integument is often comparatively thin and yielding, and thus produces a distortion of form when the body dries after death.

Our British species of this family fall readily into three perfectly distinct sections, the Emesina, the Reduviina, and the Nabidina. It may be noted that by some Hemipterists the third of these is reckoned as a distinct family.

Sub-family I. **Emesina.**

This sub-family contains the most delicate of all the Heteroptera, with the body attenuated and the legs extremely elongate and slender, finer than the finest human hairs. This extreme slenderness makes them very difficult to see, unless they betray their presence by some motion or other. The described species are fairly numerous, but the Palaearctic Region cannot boast of more than twenty-six, of which our own Fauna possesses three only. Though so delicate and slender, they are distinctly rapacious.

179. **Ploiariola vagabunda** L.

Lin., F.S. 972 (1761) ; D. & S., B.H. 536 (1865) ; Saund., H.H.B.I. 159 (1892).

Ova. Not described.

Larvae. Last instar, 5½ mm. Elongate, similar in form to adult ; head and pronotum whitish, a narrow dark streak running from eyes along sides of head and pronotum ; wing-pads with white margins, the rest thickly covered with black dots ; abdomen grey, rather mottled with transverse rows of black dots, of which the two central ones are larger and more distinct on the rows at the margins of the segments ; whole surface with long, scattered, curved hairs ; legs and antennae barred as in adult, but with bars on antennae smaller, and therefore the white interspaces larger ; hairs on legs and antennae curved, and *much* longer than in adult ; tarsi two-jointed ; rostrum very stout.

Life-cycle. The imago is found from July to October, and there is a record for March. Both Morley and I have taken the insects *in cop.* in August. But Morley also took a nymph in his garden on *Geum urbanum*, August 15th, 1913, which changed to an imago on the 18th, and I also have taken the nymph in August on a spruce fir. These two specimens imply an oviposition probably not later than June.

Habitat, etc. The form of the anterior legs and of the rostrum is sufficient to indicate that the insect is predaceous, and Fallén says it has been found sucking *Culices*. Forel also saw it on windows attacking small flies, and Schiödte saw numbers on the trunks of trees pursuing small Lepidoptera. It appears to hunt its prey mainly upon trees ; thus it has been taken on firs, both Scotch and spruce, yew, ivy, oak, hazel, holly, apple trees, elder, and furze (Mason), and *Spartium junceum* (Ferrari). I have also taken considerable numbers upon palings. Duda reports finding it in Bohemia on *Picea excelsa* in July and August, always in company with *Atractotomus parvulus* Reut., and Champion beat it from a stack of cut pine branches. Fieber says it occurs in galls made by Aphides on *Ulmus campestris*, on walls in the passages of damp houses, and on damp boards in swimming-baths. Marshall has recorded it from houses in Britain. It is sometimes taken by sweeping.

The furrow in the prosternum in which the tip of the rostrum travels is very deep, and is crossed by four slightly curved ridges placed at nearly equal intervals, and the whole area, including the ridges, is covered with fine parallel transverse striae. It can scarcely be doubted that this structure, identical in principle with those in *Reduvius* and *Coranus*, which are known to have stridulation for their function, is also stridulatory, but I don't know that anyone has yet heard any sound produced by this particular insect. (Butler, 31.)

According to De Geer it flies easily and takes wing with promptitude. Burmeister states that the larva covers itself with particles of dust and lives upon prey.

Distribution. It occurs almost throughout Europe, but has not hitherto been recorded from Spain. It extends also into Siberia and reaches as far north as 65°. In Britain also its distribution is wide, for it has been recorded from all the coast counties from Yorks round to Glo'ster, and from Cumberland, Lancs, Cheshire, Notts, Leicester, Cambs, Northants, Warwick, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts. There are no records from Wales or Ireland, but it has been found in Scotland.

180. **Ploiariola culiciformis** De G.

De G. Mém., iii, 323, 4, t. 17, figs. 1–8 (1773), D. & S., B.H. 536 (1865); Saund., H.H.B.I. 159 (1892).

Ova. Undescribed.

Larvae. According to Burmeister, the larva covers itself with dust.

Life-cycle. The imago has been taken throughout the year except in February and November, so that it no doubt occurs all the year round. This is probably connected with the fact that it is less dependent upon trees than the preceding species, and hence seasonal changes do not affect it so much.

Habitat, etc. This species occurs in thatch, whether of houses or ricks, and also in faggots. J. Edwards records a few examples crawling on the walls of a counting-house in Norwich, and Fieber mentions that it occurs in arbours. The following interesting account of its habits and method of feeding is by H. J. Charbonnier: "On December 18th a specimen of this curious insect walked across my study table; it looked like a gnat, but on closer examination I saw that what looked like three pairs of legs were in reality two pairs and a pair of slender and elbowed antennae; there was something in front of the head that looked like a pair of spider's falces, and presently these were straightened out and revealed a stout pair of legs that were held in front between the antennae. When the surface was somewhat difficult, these were used for walking, and then the insect looked precisely as though it had four pairs of legs; it afterwards folded up the front pair 'Mantis fashion' in front of the head. From its rapacious look and gnat-like appearance I thought it would probably feed on these insects. On the

31st, having obtained a '*Culex*,' I put it in the box. *Ploiariola* walked round several times, but returned to the gnat and felt it over very carefully with its antennae; after two or three minutes it made a sudden spring forwards and seized the gnat's abdomen between its anterior femora and tibiae, inserting its rostrum between the segments; after sucking for five minutes it shifted its hold, grasping the base of the gnat's wing with one clasper, inserting its rostrum at the base of the wing; the gnat offered no resistance, and seemed indeed not to feel the touch of those slender hair-like limbs, its own being comparatively quite clumsy. After being sucked for another five minutes the gnat collapsed, drawing its legs together and falling to the bottom of the box. Altogether *Ploiariola* sucked its victim for about forty minutes. January 5th, put another '*Culex*' in the box: *Ploiariola* attacked it like the first one, but sprang on its back, and having seized the base of each wing, inserted its rostrum in the gnat's neck, and raising itself on its legs, fairly lifted the insect off its feet. January 15th, tried *Ploiariola* with a '*Phora*,' which was treated like '*Culex*.' March 2nd, tried *Ploiariola* with a '*Calliphora*,' first alive and then dead, but it remained untouched. March 4th, tried to tempt *Ploiariola* with a '*Sciara*,' but in vain. March 13th tried again with a '*Sciara*'; after much hesitation, and much feeling with its antennae, it seized it and inserted its rostrum, but instantly withdrew it, and would not make a second trial; '*Sciara*' is evidently distasteful to it. The front femora of *Ploiariola culiciformis* have at the back a double row of sharp spines; the anterior tibiae shut down tightly between them."

The arrangement of striae in the prosternal furrow is very similar to that in *P. vagabunda*, but it is more difficult to see. Here again there are no records that any sounds have been heard to proceed from the insect. Of course it is conceivable that the sounds may be too high-pitched for the human ear to distinguish.

I can find no record of its occurrence on trees, except that Reuter, quoting from Reiber and Puton, gives "quelquefois sur les arbres verts."

Distribution. It occurs through the greater part of Europe, but its range does not extend further north than 61°; it is found also in Tunisia, Algeria, and Turkestan. In Britain its distribution appears to be much more restricted than that of *P. vagabunda;* it is recorded from eleven counties only, viz. Cumberland, Yorks, Notts, Norfolk, Suffolk, Essex, Surrey, Sussex, Hants, Dorset, and Somerset, and in most of these it is rare. The only Welsh record is from Glamorgan, and it has not been found at all in either Scotland or Ireland.

181. **Ploiariola baerensprungi** Dohrn.

Dohrn. Linn. Ent., xv, 60, E.M.M. xxxiv, 217.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in June and August.

Habitat, etc. The first example mentioned below was taken from a stack of cut pine branches, where it was in company with many specimens of *P. vagabunda.* Others were from lichen-covered larches and another under oak bark. There appear to be no other published notes of the habits of this little-known insect.

Distribution. This is a distinctly rare species, being recorded from Britain, France, Germany, and S. Russia only, of European countries. Only a few British specimens are known, the majority of which have come from the New Forest; the first, however, was taken by Mr. Champion at Esher, Surrey, August 30th, 1874, although as it was on a pile of cut branches it may not actually have belonged to that locality. Twenty years then passed before others were captured, and those were by several collectors on various occasions in the New Forest. Lastly, Mr. H. Britten took one at Thame Park, Oxon, under oak bark.

Sub-family II. **Reduviina.**

In the classification adopted in Saunders' "Hemiptera-Heteroptera of the British Islands," and followed in the latest British List, published 1908, this sub-family is made to cover all the rest of the *Reduviidae* except the *Nabidina*, in which case it contains a large number of sub-divisions, which by some Hemipterists are regarded as sub-families, and of our three species each represents a distinct sub-division, *Pygolampis* belonging to the *Stenopodina*, *Reduvius* to the *Reduviina* in its restricted sense, and *Coranus* to the *Harpactorina.* There are many other groups which have no representatives in the British Isles. Thus the British representatives of the Reduviina (*sensu latissimo*) form the merest fragment of an enormously extensive sub-family of which the Palaearctic Region alone contains upwards of two hundred species.

182. **Pygolampis bidentata** Goeze.

Goeze. Ent. Beit., ii, 243 (1778); D. & S., B.H. 539 (1865) (bifurcata); Saund., H.H.B.I. 161 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in May, June, August, and September, and apparently that is all that can be said at present with regard to the life-cycle of this rare insect.

Habitat, etc. As stated in Douglas and Scott's "British Hemiptera," the first British specimen of this insect was taken by Mr. Thomas Marshall, of Leicester, about thirty years before the publication of that work, and therefore about eighty-seven years from the present date (1922). It was found in September under a piece of sandstone at Quatford, near Bridgnorth, Salop. The late Mr. W. West was so fortunate as to take a second specimen in the New Forest on May 22nd, 1914. This latter specimen, which is a ♂, was taken by sweeping on the railway bank between Brockenhurst and Beaulieu Road Station. A third specimen is reported to have fallen to the lot of Mr. T. H. Edmonds, who took it near Totnes, Devon, by sweeping in a damp place. This specimen I have not seen. Though this insect has a wide distribution, it is always rare, and I believe occurs merely sporadically. Very little is known of its habits. According to Fieber, it is found in dry, grassy, sunny places, but Amyot and Serville say that it occurs in forests. Gredler (Rhyn. Tirol.) gives under bark and stones. Mr. T. H. Edmonds tells me that he has taken the species under *Ononis* in Macedonia. Some larvae of a certain species of the Stenopodina, which I have lately received from India, have been thickly covered with sand and clay, and this seems to imply a burrowing habit; if *Pygolampis* has similar habits, its not having been met with during so long a series of years would be less inexplicable; such habits would also accord with the method of occurrence of the first specimen. Still, this is only conjecture. Schumacher reports it from marshy places.

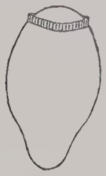
In the English literature there seems to be some confusion with regard to the sexes of this insect. The figures given in both Saunders' "Hemiptera-Heteroptera of the British Islands" and Douglas and Scott's "British Hemiptera" are those of the ♀, which is curious seeing that the original specimen is said to have been a ♂. There is some confusion also in the text of Douglas and Scott's work. The authors say that "according to Fieber" the abdomen of the ♀ ends with two obtuse plates: this is an error. Fieber's words, "*After gestutzt, in zwei stumpfe Lappen endend*," refer to the ♂ and not to the ♀, of which he says merely "*After kegelförmig*." The description of the ♂ genital segments, moreover, is not reconcilable with the real form of those parts. Saunders again says, "I do not know the female, and yet this is the sex figured in his work. One would imagine, therefore, that the original specimen must have been really a ♀, though mistaken for the opposite sex. I have not been able to trace this specimen.

Distribution. *P. bidentata* is distributed throughout Europe, and extends into Turkestan and right across Siberia, but it is a rare species everywhere. In Britain, as above mentioned, it has occurred in three places only, the first Quatford in Salop, the second near Brockenhurst in the New Forest, and the third near Totnes in Devon.

183. **Reduvius personatus** L.

Lin., F.S. 942 (1761); D. & S., B.H. 544 (1865); Saund., H.H.B.I. 162 (1892).

Ova. The following description is given by Leuckart. The eggs of *R. personatus* recall by their form those of the *Pentatomidae*. They are oval and obese, fully 1 mm. long, narrowed towards the base and furnished at the flatter end with a rather flat lid which carries a groove. The brownish-yellow chorion is decidedly hard. The outer surface is quite smooth and shining, the inner, on the contrary, is of finely granulated appearance. No further structure can be seen except here and there a minute canal leading to the under surface of the chorion, and undoubtedly intended to bring air into close contact with the yolk and the embryo. The outer margin of the groove round the lid is lengthened into a thin, projecting, rimlike lamella, on the inner wall of which there are a number of vertical prominences. These are the micropyles, and their number may amount to about eighty. In each of these micropyles can be distinguished two parts, one outer and cup-shaped, the other inner and canal-shaped. The former is attached all along to the inner surface of the lamella; it begins with a transverse opening close beneath the upper margin of the rim, and gradually narrows till it reaches the bottom of the groove. The free, cup-shaped part is continued into a canal which penetrates the chorion. Out of the lower end of the cup there arises a fine passage, the above-mentioned under segment of the micropyle, which runs down for a space in the substance of the chorion, and then after a short bend opens on to the inner surface.


Egg of *Reduvius personatus* L. (After Leuckart.)

Larvae. The larva is somewhat similar in form to the adult, and has the peculiar habit of covering itself, body, legs, and basal joint of antennae with fragments of foreign matter, which might perhaps collectively be called "dust;" its appearance is thereby greatly altered, as is suggested by the specific name *personatus*, "masked." These particles are attached not so much to the body itself as to the long and fine hairs with which it is covered, and which appear to have some adhesive power. By what means the fragments are placed in position I cannot say, but there seems no doubt that the device is intentional and not accidental, as it occurs in all examples and all stages. The habit is not peculiar to *Reduvius*. I have a large larva of an Indian species of *Acanthaspis* which carries on its back an extraordinary load consisting of numbers of pappose flower-seeds, a little flower, the skin of a hairy caterpillar, and part of the bleached exoskeleton of a woodlouse, all these being mixed up with various sand-grains. Mr. Champion has shown me a young larva of *Reduvius* which he took at Guildford; this has no foreign matter on the dorsum of the abdomen, nor on the antennae, except the basal joint, but all other parts are more or less covered. The fragments are too small to be identifiable, except under the generic name of "dust." The insect, so far as can be seen, is of a pale brown colour, and is thickly set with fine hairs, except on the dorsum of the abdomen; this is the tenderest part of the body, and has collapsed in consequence of the drying up of the abdominal contents; this elasticity may be one reason for the absence of the cover of dust. The parts most thickly covered are the two front pairs of legs. The hind femora appear to have three parallel transverse dark stripes at the apex, but nothing can be seen of markings elsewhere. Its length is about $3\frac{3}{4}$ mm., so that it is probably about half-grown.

De Geer gives in his inimitable way, an interesting account of the nymph. He says ("Mem. pour serv.," III): "Elle marche aussi vite, quand elle veut, que les autres Punaises, mais communément sa demarche est lente, et, pour ainsi dire, à pas comptés : car après avoir mis un pied en avant, elle s'arrête un peu, puis en avance un second, laissant à chaque mouvement la patte opposée en repos, et elle continue ainsi successivement, ce qui le fait paroître marcher comme par secousses et en mesure, tandis que les autres insectes avancent chaque paire de pattes à la fois, et dans un même temps. Elle fait à peu près un pareil mouvement avec ses antennes, qu'elle remue également par intervalles et comme en heurtant. Tous ces mouvements ont un air encore plus singulier qu'on ne sauroit le dire. Elle se nourrit d'insectes de toute espèce, ainsi que j'ai eu lieu de l'observer. Lui ayant présenté des Ephémères et des Mouches qui l'égaloient en grandeur, et s'en était approché à petits pas, en tâtonnant sans cesse avec ses antennes, elle sauta dessus et saisit dans l'instant de ces deux pattes antérieures une de ces Mouches, qui fit alors, mais inutilement, tous ses efforts pour lui échapper ; car la Punaise, lui ayant enfoncé dans la corps la pointe de sa trompe, elle s'occupa à la sucer. La Mouche, une fois piquée, mourut promptement, ce qui dénote assez, que la Punaise doit sans doute verser dans la playe quelque venin, dont l'effet est très-actif. Il y a toute apparence, que la garniture de son habillement singulier en poussière, et sa demarche composé et comme en tâtonnant, ne servent uniquement qu'à tromper par là les autres insectes, dont elle veut faire sa proye." The same author gives two figures of larvae covered with their coating of dust, and also figures of the same when denuded of their vestment.

Life-cycle. The imago has been found from May to September, but as it is associated more or less with places in human occupation, it probably partakes of the habits of such insects and has no definite seasons for the different stages in its life-history. Champion took a half-grown larva in November. Poujade describes the longevity of this species. A nymph which he found in August, 1887, remained in that condition till June, 1888, when it made its final moult. He kept it in a glass jar supplied with earth, and fed it on living flies, which it sucked dry. It covered itself with the earth so that it could not be seen, except when moving. Thus it lived ten months without undergoing more than one moult, viz. its final one. During the winter it became torpid and took no food ("Ann. Soc. Ent. Fr.," 1888, p. xxxi).

Habitat, etc. In both larval and adult forms it feeds on other insects, such as *Cimex lectularius*, various species of Diptera, etc. It probably feeds mainly at night, as it sometimes comes to light. It is generally found in houses or outhouses, and rarely in the open. Curtis mentions its occurrence on palings. Mr. W. H. Tuck sent me a specimen which he took in a nest of *Vespa germanica.* This had been formed in a rat's hole near water. Of course, this particular specimen may have been only a casual visitor there. It is occasionally found flying near fowl-houses. It is said to have a disagreeable mouse-like smell.

It has long been known that *Reduvius* possesses the power of stridulation. On the prosternum there is the usual median furrow, which is crossed at distances of barely ·009 mm. apart by a number of fine parallel lines upwards of 220 in number, against which the tip of the rostrum is rubbed up and down, thereby producing a chirping sound. The earliest recorded observation appears to be in Ray's "Historia Insectorum," published in 1710, where the sound is compared to the chirping of a grasshopper, and is quite correctly said to be produced by rubbing the proboscis against the furrowed sternum between the fore legs. Long afterwards an incorrect idea arose that the sound was produced by the friction of the hinder part of the head with the anterior margin of the pronotum, although the head is smooth and polished at this part. This idea no doubt originated from the up and down movement of the head as the rostrum was drawn along the furrow. But the exact structure of the chirping organs, and the precise cause of the sound remained undescribed till comparatively recently. Landois was the first to give, in 1874, an accurate account of the apparatus, and it has since been more fully described by Prof. Handlirsch in the "Annalen" of the Vienna Museum for 1900.

According to Amyot and Serville, this insect is often found dead in spiders' webs, into which it gets at night while searching for its prey. The authors add that perforation by its rostrum is venomous to spiders, and that therefore the Arachnids do not molest it, but allow it to become entangled in the webs and so perish of hunger. Latreille once had his shoulder pricked by this insect, and the wound is said to have caused the arm to become swollen for some hours.

Distribution. *R. personatus* is taken throughout Europe, as well as on the north coast of Africa and in the Maderia and Canary Is. Asia Minor seems to be the only part of Asia in which it occurs, although it is found in both the Nearctic and Australian regions. In Britain it is widely distributed, being recorded from all the coast counties stretching from Lincs to Glo'ster, except Dorset and Devon, and also from Lancs, Cheshire, Warwick, Oxon, Cambs, Surrey, Berks, and Wilts. There are no records for Wales, Scotland, or Ireland. Thus its northern limit is Lancashire.

The Palaearctic species of this genus number twenty-seven, but most of these are from the north coast of Africa, or from Turkestan, and only three others besides *R. personatus* occur in Europe.

184. **Coranus subapterus** De G.

De G. Mém., iii, 287, 27, t. 15, figs. 10, 11 (1773); D. & S., B.H. 541 (1865); Saund., H.H.B.I. 163 (1892).

Ova. De Geer gives the following description of the eggs: "Les œufs sont remarquables par leur figure. Ils sont noirs et luisans, de forme allongée, cylindrique, arrondie à l'un des bouts et un peu courbée à l'autre. Ce dernier bout est comme coupé transversalement, ayant un enfoncement profond, entouré par un cercle en forme de bourrelet très-blanc; dans la cavité est placée une petite partie élevée en forme de vrai mamelon blanc ou jaunâtre, qui au milieu a aussi un petit enfoncement. La surface ou la coque de l'œuf est comme chagrinée ou composée de petits grains comme le cuir du chagrin. La Punaise pond et attache ses œufs par un de leurs longs cotês et nommément par le côté convexe, de sorte que la courbure de l'œuf est en dessus; car cette courbure fait que l'un des côtés est convexe et l'autre un peu concave. Ces œufs se trouvent arrêtés par une forte colle."

I obtained some eggs from a specimen taken in the New Forest; they were laid at the end of September amongst the needle-like leaves of a twig of heather, and they confirm the above description save that the colour is brown instead of black.

Larvae. The larva in the last instar, 7 mm., is very much like the brachypterous adult. The coloration, as well as the form, is similar, and the chief differences are observable in the thorax. The prothorax is very much like the anterior segment only of the same part in the adult, and it stops short at what in the adult is merely the transverse furrow and constriction, so that the hinder and larger part of the prothorax in the imago has no representation in the larva. The scutellum and wing-pads much resemble the corresponding parts in the brachypterous adult, though the latter are not so long. In the abdomen the connexivum is not clearly defined, but in other respects, this part of the insect also agrees with the adult; tarsi two-jointed, with the basal joint extremely short, and antennae five-jointed; whole insect covered with long hairs; no ocelli. An earlier instar, 4½ mm., is almost identical with this, but the abdomen is much shorter, and the wing-pads shorter; rostrum very stout.

The newly hatched larva is red.

Life-cycle. I have met with the full-grown larvae in August, and the insects of the year apparently mature as a rule either at the end of July or the beginning of August. Adults have been taken from March to October, except in May; these records seem to show that the insect hibernates as adult. Curtis speaks of pairing as taking place in October.

Habitat, etc. Essentially this insect is an inhabitant of heaths, where it runs about on the ground in the open spaces amongst the heather plants. The dark soil with an admixture of numerous grains of quartz, which usually constitutes the foundation of such localities, produces a general grey effect with which the colouring of the insect is entirely in harmony, so that it easily escapes detection until it moves. When disturbed, it runs spasmodically, with frequent stoppages, as if to avoid calling too much attention to its movements. Sometimes it climbs into the ling, from which Jennings has beaten it. But though essentially a heath insect, it is not confined to such localities. In South Wales I have found it on sandhills on the coast, and at Deal it occurs similarly as well as under *Erodium*. Curtis also found it on sandhills at Pegwell Bay. According to Fieber (2) it may be found under grass-tufts, *Artemisia campestris*, and *Echium*. Fallén says it occurs under dried cow- and horse-dung, and Tuck found it in a dead rabbit (Morley, 4). Morley (4) found it on Lakenheath Warren, Suffolk, preying upon *Trapezonotus arenarius*.

Unlike the generality of the larger Hemiptera, this species exhales a fragrant odour, which has been likened to that of mellow apples or ripe pears.

It has the power of stridulation. In the prosternum there is the usual central furrow, which is transversely striate with about 170 fine curved lines placed $\frac{1}{200}$ of a millimetre apart. Against these the slightly rugose tip of the rostrum can be rubbed up and down, producing a chirping noise. According to observations made by Handlirsch, the sound is not emitted except when the insect is suddenly exposed to danger, real or imaginary. The nodding movement of the head when producing the sound is quite perceptible. De Geer appears to have been the first to note the fact of stridulation, and to give the correct explanation of it. The apparatus is figured by Prof. Handlirsch in the " Annalen " of the Vienna Museum for 1900.

This insect is dimorphous, but the macropterous form is rarely met with. In the brachypterous form the hemielytra are barely half the length of the body, though provided with both corium and membrane. The two forms are found in both sexes.

In attacking its prey, the rostrum is evidently a formidable weapon, and its prick is apparently very virulent. A specimen which I (47) had under observation very cautiously approached a half-grown caterpillar of *Spilosoma lubricipeda* and gave it a sudden prick, then retreated at once so as to be out of reach of the struggles of the caterpillar ; this first prick seemed to benumb the prey, which, after a few spasmodic twistings, remained more or less inert. The *Coranus* again cautiously approached and gave another prick. After a few feeble twistings, the caterpillar became quite still and was evidently dead. Two pricks of the rostrum therefore were sufficient to kill it. Observing this, the *Coranus* advanced to its banquet and did not leave its prey till it had sucked it dry, its own body at the same time becoming greatly distended.

Distribution. It is found throughout Europe and extends into Turkestan and Siberia; it occurs also in Tunisia. In Britain it has been recorded from the coast counties from Lincs to Cornwall, and from Cumberland, Berks, and Surrey; in Wales it has occurred in the counties of Glamorgan, Carmarthen, and Pembroke, and it is found in Scotland, but there are no records from Ireland. Hence its largest continuous area is south of the Thames.

Sub-Family III. **Nabidina.**

Of this sub-family, considered by some authors as a distinct family, fifty-three Palaearctic species have been described, and that is a fair proportion of the whole group in its world-wide extension. Our British Fauna contains no more than a dozen species, and one of these has but slender claims to inclusion in the list. Almost all are more or less ground insects, living amongst low herbage, either at the roots or on the plants themselves. J. E. Mason (1) says: "The food of this family appears to be other insects, especially small lepidopterous larvae and aphides. They hold firmly and boldly to them, and even in the sweeping-net will again seize them after being once detached." According to Kirkaldy (9) the eggs are inserted in plant-tissues almost to their very end (see also below).

The late Dr. Chapman has given an excellent account of the eggs of a *Nabis* which he found imbedded in the stems of *Chlora perfoliata*, as follows: "At the beginning of last July I found on our Downs here, stems of *Chlora perfoliata* with certain circular marks. These were about 0·21 to 0·24 mm. in diameter, were slightly raised—i.e. the surface round them sloped triflingly up to their margins. Their position was very regular and orderly, generally on the second or third internode above the ground, though occasionally higher; they were placed in a regular line down one side of the stem in numbers varying, but generally from about four to eight, rarely only one or two; they were almost always at exactly equal distances from each other —viz. about 2.0 mm. These proved to be the eggs of a species of *Nabis*, Dr. Sharp believes *lativentris*; the only ground for supposing it to be some other species being that that species is more widely distributed than *Chlora perfoliata*, and therefore if it be *lativentris*, it must be in the habit of ovipositing in various other stems—a highly probable circumstance, since *Nabis* not being a vegetable feeder, merely the mechanical qualities of the stem can be of any importance. At any rate, the young bugs that hatched from these eggs are certainly some species of *Nabis*. By the time some of these had hatched, and I had learned what the little circles were, I found that (about July 10th) the further eggs discoverable in the field were also hatched and so my notes on them are founded chiefly on the empty shells, though I had previously determined by section that the eggs contained developing embryos.

The stem of the *Chlora* consists of a delicate bark, then a dense woody layer about 0·2 mm. thick, and a centre, hollow or with a delicate pith. The eggs occupy a hole directly penetrating the woody layer, and then bend down in the central pith for about 1·2 mm., swelling out a little in it. How they are placed here I do not know, but no doubt when the oviposition takes place earlier in the season, the stems are comparatively soft and fleshy, and it is not so difficult a procedure as it looks in the hard woody stems I found. Nevertheless, I notice that the vegetable fibres are not thrust aside to more than a slight extent, and many look as if they were cut across to form the hole. This hole is very smooth and very circular. The egg-shell in the pith, after the bug is hatched, is quite a substantial colourless bag.

When the egg hatches, it opens by an elaborate lid or stopper being pushed off, or rather out. This lid occupies the whole thickness of the woody layer, and when pushed out, leaves the whole of the tube in this layer lined by egg-shell, so that it is more like a stopper in a bottle than a lid. When pushed out it does not fall, but remains attached to the egg by several twisted films, which retain it, at a distance of about half a millimetre, in a position as if its being pushed back into its place were contemplated. This stopper is of a white pith-like texture and highly organised structure. It is a slightly conical tube, with a diaphragm near its inner opening; the outer surface is longitudinally striated. The inside is impressed with hollows in several irregular series, such as might be made, if it were on a larger scale, by making grooves with rounded ends from the edge to the bottom, whilst it was still soft material, by pressure of a finger, then repeating this, in a shorter series and again by another, with only the finger tips within the margin. The flat bottom has also a number of upright, slender processes, sometimes branched, half the height of the hollow they are in" ("The Entomologist," 1906, p. 78).

185. **Prostemma guttula** Fab.

Fab., E.S., iv, 208, 54 (1794); D. & S., B.H. 546 (1865); Saund., H.H.B.I. 164 (1892).

Ova. Undescribed.

Larvae. The larva in its last instar, 7½ mm., has very much the shape of the adult. It is shining black with reddish-yellow legs, connexivum, and coxae, and a broad band on each side of the abdomen beneath, continous with the connexivum, yellow. There is also a yellow band across the abdomen dorsally, consisting of the apical half of the second abdominal segment and the anterior margin of the third; this yellow band also is continuous with the connexivum; the hind margin of the metanotum also is yellow, appearing as a pale margin just beyond the end of the wing-pads. The whole insect is slightly hairy. There is no trace of the brilliant scarlet which the hemielytra will show when adult, for the wing-pads are black and shiny.

Life-cycle. There are records for the imago in April, June, August, and September.

Habitat, etc. The insect occurs at the roots of grass and amongst stones, especially in sandy places ; e.g. I have found it on the sandhills on the coast of Jersey, sometimes under dried cow droppings. According to Dufour, it occurs also under stones and vegetable débris. He adds also that it can inflict a very painful wound with its rostrum.

The species is dimorphous, but only the brachypterous form has occurred with us, and the macropterous, a very handsome insect, is rare wherever the insect occurs.

Distribution. It inhabits Central and Southern Europe, the north coast of Africa, and Syria. In Britain it is of the rarest possible occurrence, only four specimens having been recorded. Curtis mentions one as taken near Sandwich by A. Kennedy in 1837 ; one was taken at Charlton, Kent, by E. W. Janson ; one in Lancashire by J. Sidebotham ; and there is one in the Power Collection labelled Llandudno (Carnarvonshire). Thus it has been met with in three counties only.

186. **Nabis apterus** Fab. (subg. Aptus or Nabis Osh. Cat.).

Fab., E.S. Sup. 546, 54 (1798) ; D. & S., B.H. 549 (1865) (brevipennis) ; Saund., H.H.B.I. 166 (1892) (brevipennis).

Ova. Undescribed.

Larvae. The earliest instar I have seen, $2\frac{3}{4}$ mm. long, and probably the second, is dark pitchy-brown and shining, with the tibiae and antennae yellowish. The body is almost cylindrical, and there are a very few pale hairs scattered here and there on the legs. The next and probably the third, $3\frac{1}{2}$ mm., is similarly coloured and almost equally shining. It is widest across the region of the wing-pads, the lateral margins of which are pale ; the whole body glabrous except the front of the head, which carries a few long, fine hairs ; tibiae set with long and very fine hairs ; there are also some on the femora, but still more difficult to see ; in their dark colour and shining appearance these two instars differ considerably from the succeeding ones.

A later instar, probably the fourth, $5\frac{1}{2}$ mm., is not so dark, and the fore parts are less shiny ; there are scattered silvery hairs ; lateral margins of thoracic segments and wing-pads yellowish ; a reddish triangular patch on each side of the middle of the basal abdominal segments.

Nymph of *Nabis apterus* F.

In its last instar, 7 mm., the larva is broadly fusiform, widest in the middle of the abdomen ; its general aspect is very much that of the ♀ adult, on a smaller scale ; it is almost entirely dark reddish-brown, rather darker in the fore parts and across the middle of the abdomen ; wing-pads small, and not reaching much farther than base of abdomen ; legs showing but faint traces of the rings which are so conspicuous in the imago ; these, however, seem to be really present in the epidermis, but to be obscured by the darker colour beneath, for they show quite distinctly in the cast skin.

Life-cycle. The larva is usually full grown by the latter part of July, and the imagines are then to be found from August to October. The second instar mentioned above was found on June 14th, the third on June 22nd, and the fourth on July 8th. On July 15th, 1893, I obtained some in the last instar; I took five of them, which seemed well-fed and nearly full-grown; they all became imagines during the course of the next week. Occasionally the larval stages last on into August, and on the other hand I have found an imago in July, and there is a continental record for it even in June, but the majority of specimens are taken in August and September. It is doubtful whether this insect hibernates as an adult, for there are no records of its appearance in spring. As it lives on deciduous trees, there would be no shelter for it after October unless it migrated to suitable quarters.

Habitat, etc. The adult is almost always found on trees, and I have noticed that the tree selected is very generally hawthorn; it has been recorded from hazel, Fieber (2) gives elm, and Jennings (1) found it on oak and hornbeam; Reuter (19) gives also birch and alder. This does not, however, imply a vegetable diet, and the object the insect has in frequenting the trees is, no doubt, to secure access to the abundant insect fauna which inhabits them. The great abundance of insects of various kinds that live on hawthorn must be the special reason for the selection of that particular shrub. Here there would be always a well-supplied larder, which with very little effort would yield sufficient to satisfy the cravings of the most ravenous *Nabis*. Of the five specimens mentioned above, one, though it completed its ecdysis, appeared distorted and shrivelled, and the explanation very probably was that it had been sucked by its companions. The nymphs are sometimes found amongst grass and other herbage growing under hawthorn bushes. Morley (4) says that the imago sometimes comes to Lepidopterists' "sugar" on tree trunks at night. Giard says it feeds on *Aphis ulmi* De G., a species which causes deformity to elm leaves. Frey Gessner says that it occurs on *Alnus* in leaves which have been rolled up by Aphides, and Reuter (19) that it sometimes ascends conifers, probably to prey upon species of *Lachnus*, the special trees being *Pinus silvestris* and juniper.

The cast skin is more or less pigmented, showing plainly some of the markings, especially the rings on the femora and the spots on the connexivum. Thus, unlike what is the case in the *Pentatomidae*, a good deal of the pigment which gives the insect its ordinary appearance, lies in the cuticle.

The species is dimorphous, but only two records have been made of the occurrence of the macropterous form in this country; one specimen is in the Power Collection, taken at Spridlington, and the other was taken by B. S. Harwood (2) at Colchester in 1905.

Distribution. It lives in Central and Southern Europe, and in Algeria, Siberia, and Japan. It is pretty widely distributed in Britain, being recorded form the coast counties extending from Lincs to Dorset, and from Salop, Notts, Cambs, Hants, Warwick, Worcester, Oxon, Herts, Middlesex, Surrey, and Berks, as well as from Pembrokeshire in Wales. There are no records from either Scotland or Ireland, hence Lincolnshire is its northerly limit.

187. **Nabis lativentris** Boh. (subg. Aptus or Nabis Osh. Cat.).

Boh., V.A. Handl. 111 (1851); D. & S., B.H. 550 (1865) (apterus); Saund., H.H.B.I. 167 (1892).

Ova. Under the name *Nabis subapterus*, Amyot and Serville give what purports to be a description by De Geer of the eggs of this species; but it refers really to the insect now known as *Coranus subapterus* (q.v.).

For a description of the egg of our present species see Dr. Chapman's note, *ante.*

As the adult ♀ has an ovipositor containing the usual four saws which combine into a single dagger-like weapon, something like a Malayan kris, and has its saws strongly serrate for about $\frac{2}{3}$ mm. from the apex, it is not easy to understand how an ovipositor with a wavy blade such as this can be used so as to produce a perfectly circular and smooth hole. Hungerford has described a similar arrangement of the eggs of the American *Mesovelia mulsanti* White, in the stems of water plants, and states that the ♀, rocking the body slightly from side to side, causes the entire drill (which in this case is spear-shaped, "to rotate or twist back and forth on its axis, rapidly at times, or again more slowly as may suit the necessity of the work, until a hole is effected, and the ovipositor is buried to its base." If such a method is applicable in our present case, the movement must be rather more complicated because of the difference in the shape of the borer.

In August, 1918, I found on the Chiltern Hills in S.E. Oxfordshire a somewhat different arrangement of eggs, which, nevertheless, I think must belong to the same species. The *Chlora* stems here were older, apparently in their second year of growth, the plant being a biennial; the ends of the eggs were not circular, but a very much compressed oval, as if they had been subjected to strong lateral pressure, so that they became parallel-sided; and each was at the bottom of a slight depression caused by the longitudinal splitting of the outer layers of the stem. The parts imbedded corresponded to those in Dr. Chapman's specimens, which he was good enough to transfer to my collection. These eggs unfortunately did not hatch, and may, indeed have been dead when I found them, possibly killed by the pressure which had altered their shape.

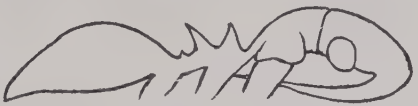
Of course many questions arise here, such as the cause of the difference in the two cases, the time of oviposition in the latter instance, whether during the first or the second year of the life of the plant, the source of the assumed lateral pressure, etc. As to the purpose of the enclosure of the eggs in the stem of the plant, the only suggestion that I know of is that of Dr. Chapman in his note, making it depend upon the mere mechanical properties of the plant, which would protect them from damage and would prevent them from drying up. One must not forget, however, the apparent egg-growth, in which case absorption of the fluids of the plant must take place. As the insect is much commoner than the plant, as well as much more widely distributed, it is evident that, if enclosure is always necessary, other plants besides *Chlora* must be used for the purpose.

Larvae. The larva as it issues from the egg is not unlike a little ant, about 1.75 mm. in length ; here is a description of a specimen just under 2 mm. long, and therefore probably in the fully grown form of the first instar : Narrow and parallel-sided, pale chocolate brown, sparsely set with long, fine hairs ; head large, conical, and with a hindwardly arched sulcation from eye to eye, the area in front of it being rugose ; eyes not prominent ; ocelli none ; thorax with a pale line down the middle ; pronotum rather longer than head, straight in front, rounded behind, and with pale foliaceous lateral margins ; mesonotum with lateral margin produced in the middle of each side into a strong, upwardly directed spine ; metanotum with a similar spine directed vertically, and placed on a level with the hind margin instead of medially ; the first two abdominal segments with a somewhat foliaceous broad white border ; a central blunt tubercle close to the hind margin of the first segment, and a very slight trace of a similar one on the second ; hind margin of second segment pale, remaining segments very convex dorsally ; antennae four-jointed, stout, terminal joint thickest and longest and constricted in the middle ; legs with femora reddish ; first two pairs of tibiae pale yellowish, hind pair dark reddish-brown in the middle, becoming paler at base and apex ; tarsi two-jointed, basal joint very small, brownish, second joint long and pale, with apex fuscous ; claws long, brownish at base, becoming pale outwardly ; fore femora very stout and set beneath with a row of six or seven stout setae, placed rather remotely from one another ; rostrum stout, extending to intermediate coxae.

Later instar, 4 mm. Similar to above, but darker, with the long hairs much stouter, and antennae proportionately more slender ; hind tibiae strongly fringed inwardly ; white foliaceous expansions at base of abdomen broader and more distinct.

Later instar, 6 mm. Head similar in shape to that of adult, but eyes not quite so prominent, and still no ocelli, though there are faint indications of the spots at which they will appear ; surface between the eyes distinctly shagreened, the other parts more faintly so. Colour of fore parts deep chocolate-brown ; pronotum trapezoidal, very globose above, but with a deep furrow on each side just before the humeral angles ; margin behind the furrow cream-coloured ; wing-pads and scutellum considerably broader than thorax, brown with outer angles of wing-pads yellowish ; metanotum with a blunt spine in the middle, yellowish, with a transverse brown fascia enclosing the spine, and a median reddish streak in front; first abdominal segment brown in the centre with two obsolete prominences, and cream-coloured at the sides, which are broad and foliaceous; this is continued as the cream-coloured connexivum, gradually narrowing to the sixth abdominal segment, when it disappears; abdomen dark blackish-brown and shiny, very convex above, rising far above the first segment, which lies in a hollow; underside brown with three basal abdominal segments broadly margined behind with cream-colour; legs brown, with first two pairs of tibiae paler; front femora beneath with stout dark spinous hairs, mainly in two rows; these are replaced in the adult by a large number of closely set fine white silky hairs; second pair with similar but shorter sharp spines, which are replaced in the adult by thickly set dark hairs, stouter than those on the front femora; hind femora simple; tibiae hairy, but with the hairs on the inner side much finer than in the adult, tarsi with the usual very short basal joint and long terminal one; basal joint of antennae not so stout as in the adult; body set with a few long, scattered clavate hairs.

There are probably two other intermediate instars besides those above described, of which the last two are probably the third and fifth. The fourth is very dark in colour, has the spines very well developed, and shows the rudiments of the wing-pads. But from what has been said, it will be evident that the larval changes consist of a good deal more than the very necessary ones of mere alteration in size and acquisition of wings. In being furnished with spines on the middle of the body and also with pale foliaceous margins at the same parts, this larva is unique in the genus *Nabis*, and what is still more remarkable, these organs and markings entirely disappear in the adult insect; no other British *Nabis* has any spines at all, either as larva or as adult, nor has any other species those distinct white markings which seem, as it were, to narrow it at the waist. Here, then, is a whole set of apparatus, which is purely temporary in character, and is destined to be entirely discarded when the insect attains maturity; the problem is, therefore, to find a valid reason both for their presence at all, and in this species alone. Of course these spines in a profile view are rather suggestive of those on the propodæum of an ant, but the correspondence is not very exact, as they are more numerous, some are paired and some single, and they are appended to a different part of the body, so that this by itself does not bring us much nearer to an explanation, and we need to find out what advantage it is to the young larva, if any, that it should be myrmiciform. It is a further interesting question why this species alone has larvae showing superficial resemblance to ants and therefore entirely unlike the rest of the genus, although



Profile of young larva of *Nabis lativentris.*

the adult very closely resembles in form and appearance one of the other species (*N. apterus*), and is not widely different from several others. By systematists, this species is included in the same subgenus as *N. apterus* F. and *N. major* Costa, an arrangement which is certainly not supported by the larval forms, since all three of these are of different types of structure.

Life-cycle. The larvae are abundant in July and August, maturing at the end of the latter month. The adult has been found from January to November. Evidently, therefore, it hibernates as an adult, and those found in the early months are the produce of the preceding summer. The life of the individual would seem to last, as a maximum, for about fifteen months; but no details are available as to date of oviposition. Morley (4) says that the insects copulate freely in captivity.

Habitat, etc. *N. lativentris* lives mainly on the ground amongst low herbage. It is also taken by sweeping. Morley (4) and I have both found it commonly in some places on nettles. Gredler (Rhyn. Tirol) gives " under Ribes in March." The fully grown larvae are much more conspicuous than the adults in consequence of the cream-coloured base of the abdomen; they also seem to be less inclined to hide under herbage. The insect is, doubtless, most naturally carnivorous, feeding upon living prey, though the direct evidence as to its food is slender. A small larva was found by Donisthorpe at Chale, I.W. on July 24th, 1906, sucking a ♀ *Plagiognathus arbustorum*, which was much larger than itself (Poulton, " Trs. Ent. Soc.," 1906). The rostrum is characteristic of a predaceous insect, not being enclosed between bucculae, but being strongly curved and meeting the body at the apex only; thus it has complete freedom of motion, and can be thrust forward to reach prey in front of it; add to this the predatorial shape of the fore legs, and further evidence seems scarcely to be needed.

The ant-like form of the larva suggests myrmecophilous habits, at least in that period of its existence, and there are a few observations confirming this suggestion. It has been found running about in company with *Formica fusca* at Howth, Ireland (Halbert, 4), with *F. sanguinea* at Wellington College, and with *F. fusca* and *Acanthomyops niger* at Chale (Donisthorpe). Donisthorpe also found the young larvae in the nests of *F. sanguinea*, and with other ants in Sussex and Cornwall. Hamm found it with *Acanthomyops fuliginosus* and *A. niger*. I know of nothing, however, which definitely shows what are the relations between the ants and the bugs, everything that has been suggested being of the nature of conjecture only. Moreover, the larvae, especially in their later instars, are quite as often, if not much more so, found running about on the ground independently of ants. The distribution of the species, again, is far wider than that of *F. sanguinea* or even of *F. rufa*, though probably more closely conformable with that of *A. niger*. If the ant-like appearance is protective in function,

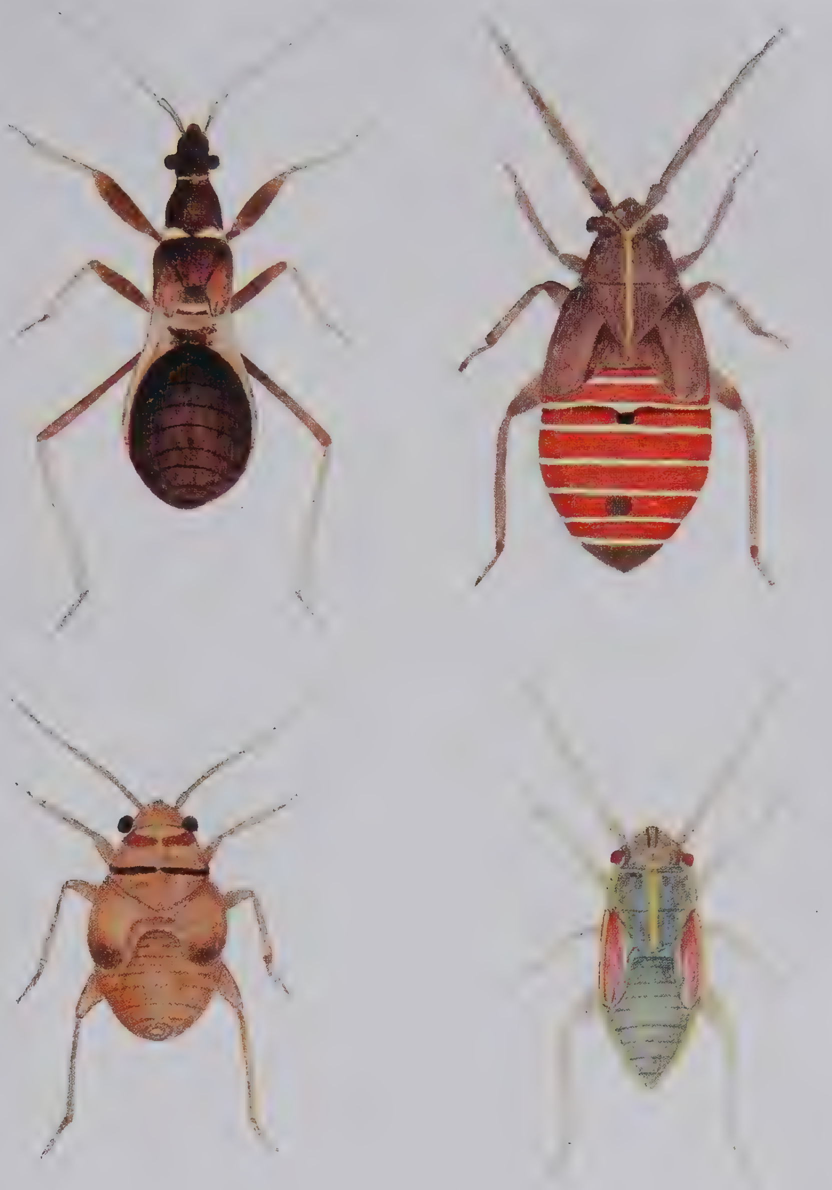


PLATE IV.

NYMPHS OF HEMIPTERA-HETEROPTERA.

1. Nabis lativentris Boh. ×8.
2. Psallus betuleti Fall. × 11.
3. Camptozygum pinastri Fall. × 11.
4. Conostethus roseus Fall. × 18.

E. A. Butler del.

it would seem that, as ants do not alter in size, while this larva does, the ant association should be with different species at different periods in the life-cycle, with smaller species of ants such as *A. niger* when the *Nabis* is quite young, and with larger species such as the *Formicae* when it is more fully grown. This is to some extent confirmed by Donisthorpe's observations, though the presence of *young* larvae in the nests of a *large* ant like *F. sanguinea* is not consistent with this idea; protection would seem to be lessened, too, when the nest is that of a *Myrmica*, on account of the difference in colour.

An observation made by Dr. Marchal in France shows that this insect may, on occasion, fulfil a useful rôle. He noticed, one day in July, that eggs of the butterflies *Pieris brassicae* and *P. rapae*, which were on the leaves of some cabbages, were empty, but had evidently reached that condition, not by the regular process of hatching, but had been in some way rifled of their contents. Finding numbers of nymphs of *Nabis lativentris* on the leaves of the cabbages, he suspected them of the raid. He therefore placed one of these insects in front of a fresh batch of *P. brassicae* eggs. It paused for a few moments, then felt over the eggs with its antennae, and finally plunged its rostrum into the basal part of an egg, which, as is well known, is shaped rather like a champagne bottle. It remained quite still in this position, and soon sucked the egg dry. It then passed to another and another until most of the batch had been emptied.

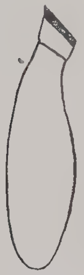
Like most species of *Nabis*, this insect is dimorphous in both sexes, the usual form, brachypterous, having both hemielytra and wings possessed of the ordinary parts, but considerably abbreviated. The macropterous form is very rare in this country, only five specimens being recorded, one in the Cambridge Museum (*en coll.*, Jenyns) taken at Bottisham; one in the Power Collection taken at Woolacombe; one taken by E. Saunders at Bournemouth; one by B. S. Harwood (2) at Colchester in 1905; and a fifth by E. A. Atmore at Hunstanton, September 10th, 1906. According to Puton, in France the macropterous form occurs chiefly in the south, where it is not uncommon. Whether the macropterous examples make much use of their wings is not known; the brachypterous ones are scarcely likely to do so, and in such a case one wonders why the abbreviation has stopped where it has, and has not become complete by the total disappearance of flight organs. (See however p. 118.)

Distribution. *N. lativentris* is found over practically the whole of Europe; also in Morocco, Algeria, Syria, and Asia Minor. In Britain it is widely distributed, being recorded from all the coast counties from Northumberland round to Somerset, except Yorks, and also from Cheshire, Cambs, Oxon, Bucks, Herts, Surrey, Berks, and Wilts; from Wales it is recorded for the counties of Carnarvon, Glamorgan, Carmarthen, and Pembroke. There are no records for Scotland, but it occurs in Ireland.

188. **Nabis major** Cost. (subg. Aptus or Nabis Osh. Cat.).

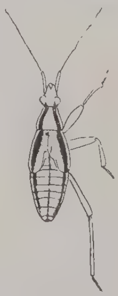
Costa, Eserc. asp. nat., ii, 9 (1840); D. & S., B.H. 554 (1865) (flavomarginatus); Saund., H.H.B.I. 167 (1892).

Ova. Ova removed from the body of a ♀ on September 24th, 1916, are as follows: Cylindrical, rounded at one end and truncate at the other; at about $\frac{1}{3}$ of the length from the truncate end, the axis of the cylinder is bent, and the diameter somewhat narrowed, till at the end itself it broadens again, so that a sort of neck precedes the end; the truncate end is bounded by a dark, apparently chitinous ring; whole surface smooth and colour creamy. The shape is something like that of *Cimex.*


Egg of *Nabis major* Cost.

Larvae. Entirely unlike those of either of the preceding species. The following is a description of an intermediate instar, 5 mm. Body broadly fusiform, greyish ochraceous, legs and antennae ochreous; a broad fuscous stripe running continuously from behind the eyes to the apex of the abdomen; a narrow stripe of similar colour down the centre of the abdomen, continued in the fore parts as a whitish stripe; head in front of eyes triangular and sharply pointed; pronotum trapezoidal, as long as broad at base, with narrow ochreous lateral margins; wing-pads short, not extending beyond base of abdomen, outwardly margined with ochreous; the whole surface more or less shining and furnished with rather long, scattered, pale hairs; tarsi two-jointed, basal joint very small, terminal very long; legs with long pale hairs; underside coloured as upper, coxae each with a dark spot outwardly at base; rostrum extending almost to posterior coxae.

A later instar, the last, 7 mm., is similar, but has the dark lateral streaks less distinct and the wing-pads longer, extending just into the third abdominal segment. A very young larva, probably first instar, $1\frac{3}{4}$ mm., has a similar coloration, but the pale lateral margins are proportionately broader, and the head has two diverging dark streaks. There are, of course, no wing-pads, and the pronotum is transverse. A larger one, 3 mm., probably second instar, is again similar, but the two black streaks on the head have disappeared, and the pronotum is much longer. In all these instars the only trace of the conspicuous black apex of the posterior femora, which is so marked a feature in the adult, is a slight infuscation of this part.


Nymph of *Nabis major* Cost.

Life-cycle. The insect usually matures in August, but in late seasons it may delay its final ecdysis till September. The adult has been found from July to October, and what happens to the insect in the rest of the year is at present unknown. I have found quite minute larvae so late as August. The above ♀ yielded seven ovarian eggs.

Habitat, etc. This species is a common inhabitant of sandhills, but it is also found amongst rubbish, at the roots of plants, and by sweeping. It inhabits damp as well as dry places. Parfitt speaks of finding it on trees and bushes, but this is exceptional. Collins has taken it by evening sweeping, and states that it hides in day-time. Morley (4) speaks of it as occurring on *Malva sylvestris*, and on reeds in July. Douglas and Scott (1) give "under bushes, plants, and field refuse."

It is carnivorous and does not object to cannibalism if the need should arise. Four fully-grown nymphs, which I once took on the Lowestoft sandhills, where it was the commonest species of the genus, I enclosed in a box, hoping to witness their final transformation. But they soon attacked one another, and in a day or two there was but a single living one left standing victorious amongst three corpses sucked dry. It was curious to note that, to save itself the trouble of perforating the skin of its victims, the survivor availed itself of their anal opening in order to suck out their juices. This habit I have noticed in other cases also, and it gives them a means of attack which is successful even against hard-skinned beetles.

This insect does not seem to possess a brachypterous form, appearing always fully developed.

Distribution. *N. major* is not nearly so widely distributed as the preceding. From the Continent it is recorded from the central and southern parts. It occurs also in Morocco and the Taurus. In Britain its area extends through the coast counties from Yorks round to Glo'ster, except Dorset, and it is recorded also from Cumberland, Lancs, Cheshire, Notts, Leicester, Cambs, Warwick, Worcester, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts. From Wales the only records are from Carmarthen and Glamorgan, and it is reported from Scotland, but not from Ireland.

189. **Nabis boops** Schiödte (subg. Stålia).

Schiöd. Nat. Tidsk., vi, 200 (1870); Saund., H.H.B.I. 168 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found at the end of July and in August and September.

Habitat, etc. This insect lives under heath, chiefly *Calluna*, at the roots of grass, on sandhills, and especially in mouse-runs under grass in heathy places. The greater number of the specimens in my collection were found in this latter situation, though what is the nature of their connexion with the runs I cannot say. Morley (4) records it from under *Erica tetralix.* I have seen only one specimen of the macropterous form of this species, a ♀ taken by Mr. G. E. Hutchinson at Tidworth Penning, Hants, on July 29th, 1919. The corium carries two longitudinal fuliginous lines, and the membrane, which is concolorous with the corium and has the nerves fuliginous, is as long as the body and, like it, narrows to the apex.

Distribution. This seems to be either a rare species, or one, the best method of searching for which is not generally known. On the Continent it has been recorded only from Denmark, Germany, France, Hungary, and Finland. In Britain also its range, so far as at present known, is restricted. It is recorded from nine counties, viz. Norfolk, Suffolk, Surrey, Sussex, Hants, Berks, Dorset, Wilts, and Glo'ster. The occurrences in East Anglia are infrequent, so that its chief district seems to be south of the Thames, in that compact area lying between Kent and Devon, and in this district its metropolis seems to be Gomshall, Surrey, where the greatest number of specimens have been taken. At Tubney, Berks, also, Collins took a dozen specimens.

190. **Nabis flavomarginatus** Scholtz. (subg. Nabis, or Reduviolus Osh. Cat.).
Scholtz. Art. u. Ver., 114, 6 (1846); Saund., H.H.B.I. 168 (1892).

Ova. Eggs removed from the body of a ♀ are of a dark ochreous colour, a rather broad, regularly curved cylinder, rounded at one end and very obliquely truncate at the other. Length, 1½ mm. The saw is abruptly bent at about one-third of its length and straight after that to the point, which is spear-shaped.

Larvae. Some very young larvae, 1½ mm., first instar, apparently belonging to this species, are nearly parallel-sided, entirely pitchy-black and shining, with ochreous legs and antennae, the latter slightly infuscated at apex. The antennae are rather longer than those of *N. major*, and the shape of the body is quite different.

The next instar, 2¼ mm., similar but with pale central and marginal lines; head short, triangular.

In a late instar, 6½ mm., the larva is very much like what the imago would be if deprived of its hemielytra and wings. There is the same dull, blackish, slightly shagreened abdominal surface with short adpressed pubescence, and the same ochreous legs with black spots. The head, instead of the single central black line, has two lateral ones, hook-shaped, with the shorter arm pointing outwards; these are cicatricose. The pronotum has a larger number of similar markings than in the adult and is proportionately shorter; wing-pads similarly marked and extending only so far as first abdominal segment; foliaceous border of abdomen much narrower; eyes prominent, and no ocelli. There is a central line, fine and reddish, through pronotum and scutellum, broader and more fuscous in the abdomen; outside this the ochreous ground colour shows in the fore parts. In other respects this larva closely resembles the imago.

Life-cycle. The adult is found from July to October. The very young larvae above described were taken in May, and the older ones about five weeks later, towards the end of June. The ova are evidently hatched before the middle of May, and the insect apparently matures in July.

But what happens between the October of one year and the May of the next is at present a mystery.

Habitat, etc. This species occurs chiefly in marshy places, whether by the coast or inland. It is found at the roots of rushes and other plants growing in such situations, and it occasionally mounts sufficiently high in these plants to be taken by the sweeping net. I have found one specimen in a chalk-pit near Maidenhead, and J. E. Mason (1) records it from the sandhills of Lincolnshire.

It is dimorphous, the brachypterous form being far the commoner. The macropterous occurs in both sexes, but is decidedly rare. I have one specimen which exhibits an intermediate condition between these two. This is a ♀, and was taken on August 14th, 1914, at Ellerby Moor, N.E. Yorks; there is a similar specimen in the Power Collection, taken at Balmuto, Fifeshire. The hemielytra do not reach quite so far as the genital segments, whereas in the brachypterous form they do not pass the third abdominal segment, and in the macropterous they extend beyond the limits of the whole abdomen. Both corium and membrane are abbreviated in comparison with the macropterous form, but lengthened in comparison with the truly brachypterous. The macropterous is sometimes found on flowers.

Distribution. It is distributed throughout Northern and Central Europe and is recorded also from Italy; its range extends throughout Siberia and across into the northern part of the Nearctic Region. In Britain it occurs in all the coast counties from Durham to Dorset, as well as in Cumberland, Westmorland, Lancs, Cheshire, Derby, Notts, Leicester, Cambs, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset. In Wales it is recorded from three counties, Carnarvon, Carmarthen, and Glamorgan, and its range extends into both Scotland and Ireland.

191. **Nabis limbatus** Dahlb. (subg. Dolichonabis).

Dahlb. Vet. Akad. Hand., 227 (1851); D. & S., B.H. 551 (1865); Saund., H.H.B.I. 169 (1892).

Ova. Undescribed.

Larvae. Last instar, 6½ mm. Elongate, linear in ♂, with dilated abdomen in ♀, ochreous, with a broad fuscous band on each side from eyes to end of body, and a dark red line down the middle from anterior margin of pronotum, the whole length of the body; pronotum much longer than broad, somewhat conical, narrowed in front; wing-pads minute, extending hardly farther than scutellum; connexivum broad in ♀, narrower in ♂; head with central lobe outlined with fuscous, and two curved diverging reddish fuscous lines on vertex; femora with rows of large dark spots; tibiae with long hairs, chiefly on inner side; tarsi two-jointed, basal joint very short, apical very long, infuscated; basal joint of antennae longer than head; legs long.

An earlier instar, 5 mm. Similar in all essential respects, but with no wing-pads.

A still earlier instar, 3½ mm. Similar, but with shorter head.

These larvae are to be easily distinguished by their elongate shape, the dilated abdomen of the ♀, with clear and distinct connexivum, the three very distinct lines of markings down the body, and the length of the legs. They are remarkable as giving in their shape while still larvae indications of their future sex, a distinction which occurs in comparatively few species of Heteroptera.

Life-cycle. The imago has been found from July to October. It does not, however, usually mature till towards the end of August. All the macropterous examples I have found have occurred in August. As there are no records for the imago of this very common insect outside the four months mentioned above, the presumption would be that it perishes at the end of October, passing the winter in the egg condition, from which larvae appear in the following late spring or early summer.

Habitat, etc. This is one of our commonest insects, and is found in great numbers amongst grass and other long herbage, and is generally taken by sweeping. It has occasionally been found at a greater height from the ground, e.g. Schumacher reports beating it in Germany from the margin of a wood consisting of *Quercus*, *Populus tremula*, *Sorbus*, *Betula*, *Rubus idaeus*. He also found it on *Myrica gale*. There are several observations indicating the carnivorous habits of this insect. Donisthorpe found a ♂ sucking the Opomyzid fly, *Opomyza germinationis* L., near Newbury, Berks, on August 6th, 1906. The Rev. W. F. Johnson exhibited at a meeting of the Entomological Society of London, October 7th, 1891, " a specimen of *Nabis limbatus* killed whilst holding on to its prey, a very hard species of Ichneumon. Mr. Saunders thought that, from the nature of the Ichneumon, the only chance the *Nabis* had of reaching its internal juices would be through the anal opening, as recorded by Mr. E. A. Butler in a similar case in the 'Ent. Mo. Mag.,' October, 1891." ("Proc. Ent. Soc.," 1891, p. xxiii.) On September 13th F. W. and H. Campion witnessed a long struggle between a *Nabis limbatus* and a Tipulid fly (*Tipula paludosa*). When first observed, the bug had seized the fly by its left wing and was striving in a determined manner to drag its prey away. The fly offered a stout but bootless resistance, in the course of which it got badly damaged by clinging to the blades of grass, etc. over which it was being slowly drawn. The pair were captured before the tragedy closed.

The rostrum, though perhaps not powerful enough to pierce the body of the Ichneumon mentioned above, is yet able to penetrate the human skin and inflict a painful wound. " On September 1st last, feeling a sharp sting on my neck, I hastily put up my hand to catch the offender, when, instead of a wasp, it proved to be a *Nabis limbatus*. The sensation was precisely that of a wasp's sting, and the appearance also. The swelling, however, was not nearly so great, and in two hours both it and the irritation had subsided. The insect, I imagine, had been trapped between my neck and shirt-collar, and had resorted to its rostrum as a weapon of defence" (J. E. Mason, 4).

Like the preceding, this insect also is dimorphous in both sexes, but the macropterous form is very rare and usually occurs singly. During some seasons, however, several specimens have been taken, as e.g. August, 1892, when I took three at Shere, Surrey. Reuter's description of the macropterous form is as follows: "Formae brachypterae colore simillimus, prothorace postice multo latiore convexioreque, scutello majore, nigro, striis duabus longitudinalibus postice convergentibus testaceis notato, hemelytris alisque completis, his longitudine abdominis, griseo-testaceis, costis et margine laterali late albis, apice summo clavi striaque infra apicem marginis interioris corii nigro-brunneis; membrana alba, venis striaque ad basin marginis interioris distinctissima nigro-brunneis; alis albis, abdomine paullo brevioribus; abdomine lineari." Considering its known distribution, as indicated below, its usual incapacity for flight has been no drawback to its enterprising disposition.

Distribution. On the Continent this species occurs in Central and Northern Europe, where it reaches 63° 40′, but apparently not in the South, although it is found in Algeria. It extends across Siberia, and is met with again in the northern parts of the Nearctic Province. In Britain it is one of the commonest insects, occurring in all kinds of localities, both wet and dry. It is included in almost all published lists, and is recorded from twenty-nine English counties, i.e. all except Westmorland, Staffs, Derby, Salop, Leicester, Rutland, Beds, Hunts, Northants, Worcester, and Monmouth, and from four counties in Wales, Carnarvon, Brecknock, Glamorgan, and Carmarthen, and from both Scotland and Ireland. According to Puton the macropterous form is northern in frequency.

192. **Nabis lineatus** Dahlb. (subg. Nabis). (Reuter and Oshanin regard this as a Dolichonabis.)

Dahlb., K.V.A. Hand. 228 (1850); Saund., H.H.B.I. 170 (1892).

Ova. Undescribed.

Larvae. The nymph, 9 mm., is shaped like the imago, but rather narrower; brownish-ochreous with a narrow fuscous stripe down the middle of the dorsum of the abdomen, bordered on each side by a pale stripe of rather greater width; connexivum also pale; the dark central streak becomes much broader in the imago, and encroaches on the pale stripes; legs ochreous, with black spots on the femora; tarsi, as usual, two-jointed, with basal joint very small and terminal very long. The nymphs show sexual distinction, so far as the form is concerned in this last stage, the ♀ being broader and having a distinct pale connexivum.

Life-cycle. The imago has been found from July to September. It usually matures at various times during August and is generally a little earlier than *N. limbatus.*

Habitat, etc. It frequents very marshy places, where it is to be found at the roots of rushes, etc. The insects walk about on the rushes and on the bare ground which usually occurs at the roots. They are generally not to be had at all freely by sweeping, but spend their lives chiefly in the semi-obscurity of these low-lying parts, under the tangled canopy of the dead and living rushes, where they must be searched for on hands and knees. They are found in suitable positions in both salt marshes and boggy places. J. E. Mason (1) records the species from the sandhills of Lincolnshire. Bedwell found several on dead heads of *Rumex,* at Herringfleet, Suffolk (Morley, 4.)

Like *N. limbatus,* this species is dimorphous, but the macropterous form is evidently exceedingly rare. I know of only one British specimen, a ♀ from a salt marsh at Southwold, Suffolk, taken on reeds on August 1st, 1904, by Mr. C. Morley (4), and through his kindness now in my collection.

Distribution. This is not a widely distributed species. Besides Britain it has been found in Northern and Central Europe, Siberia, and Amurland. In Britain it is recorded from twelve English counties, viz. the coast counties from Lincs round to Devon, except Hants, and from the inland counties of Cambs, Surrey, Berks, and Wilts. The Welsh records are from Glamorgan and Carmarthen; but it has not been discovered in either Scotland or Ireland.

193. **Nabis ferus** L. (subg. Nabis or Reduviolus Osh. Cat.).

Lin., F.S. 962 (1761); D. & S., B.H. 555 (1865); Saund., H.H.B.I. 170 (1892).

Ova. Undescribed.

Larvae. According to Osborn, the first instar is of a very delicate, almost transparent whitish colour with a length of 2½ mm. and a width of thorax of ⅗ mm. Of the four-jointed antennae, the first joint is thickest, second slightly longer than first, the third the longest, a trifle longer than second, fourth about equal to third; eyes red; a conspicuous red line on thorax and abdomen, with a dusky stripe at side of thorax.

2nd instar, length 4 mm.; a conspicuous dark red median line from head to tip of abdomen; a broad yellow stripe occupying middle of body, bordered by a dusky irregular stripe each side; legs light yellow, spotted with black, tarsi black at tip; wing-pads very slightly indicated at outer angles of meso- and metathorax.

3rd instar, $4\frac{1}{2}$ mm. The red line along the median dorsum is conspicuous, but somewhat broken, and at places slender; antennae dark, except tip of first and basal $\frac{4}{5}$ of second segments.

Osborn did not find the fourth instar, but I have specimens which I think appertain to it. 5 mm., head brownish-ochreous in front, sutures of centre lobe black, and above these two thicker black lines rather farther apart and uniting in a cross bar, rising to vertex, all the rest of head more or less blackish; pronotum trapezoidal, sides slightly curved inwards in front, black, with narrowly explanate ochreous margins; wing-pads short, similarly coloured; scutellum ochreous; abdomen with connexivum and a central line ochreous, between these black, the central ochreous line intersected by a fine blood-red line; legs and antennae brownish-ochreous, femora spotted faintly with darker; tarsi two-jointed, basal joint very small, terminal long, claws long; antennae four-jointed, basal joint nearly as long as fourth, second and third longer, subequal; surface covered with silvery curved pubescence.

5th instar, 6 mm.; width at base of abdomen about 2 mm., elongate-fusiform; head slender; eyes globose; antennae slender, first joint thickest, minutely hairy, second and third about equal in length, and slightly longer than first or fourth; fore legs with femora enlarged, middle femora nearly as large as fore, hind femora slender; beak three-jointed, reaching to base of first coxae; colour above olive, with a central spot on segments three and four and margins of abdomen yellow or salmon-coloured, tinged with orange; a dark red or red-brown median line from head to end of abdomen interrupted on base of mesothorax and at abdominal articulations; dark spots of various designs on head, prothorax, mesothorax, and wing-pads; wing-pads dusky at tip; legs with black dots, tarsal tips black; yellow spots on head, thorax, and a marginal series on abdomen in outer part of olive area; beneath olive and yellow, the former mainly in form of a broad median stripe, including some yellow spots; pectus mainly yellow, abdomen yellow (Osborn).

Life-cycle. The imago may be found practically all the year round; I have records for every month except February and December. I have taken the larva in June, but only on one occasion. Osborn considers that the appearance of the different instars of the early stages is not at all uniform, as individuals in various instars as well as adults may be found at the same time in early summer. Between June 26th and July 13th, first, second, third, and fifth instars were taken, but not in that order. During the latter part of summer only adults were found; it is therefore most probable that May, June, and July are the chief larval months, especially the two latter. Adult females contain well-developed eggs in late summer, so that probably eggs would be laid in autumn, but not hatched till the following spring. But in view of the irregularity in the appearance of the larvae, spring layings are also quite likely, especially as the adults live through the winter.

Habitat, etc. This species is taken by sweeping and by searching at the roots of grass and other plants. It frequents much drier places than the preceding. I have found it abundantly under *Ononis* on the Pendine sandhills, Carmarthenshire, and Morley (4) records it from under *Calluna* in Suffolk. Puton describes it as found in fields, meadows, and woods; Burmeister adds " on grass," and Tucker has taken it at light in America. Of course, it is a carnivorous insect and is said to destroy Aphides. In Bull. 69 from the Agricultural Experiment Station, published by the University of Minnesota, it is stated that in the State of Minnesota " this species is frequently found hiding amongst the flowers of the golden rod, where it lurks to capture visiting insects. It also destroys large numbers of the grass-infesting species of leaf-hoppers." Osborn found that it fed upon *Leptopterna dolabrata* as well as upon the smaller kinds of Homoptera.

Like *N. major*, *N. ferus* is always macropterous in this country, though J. Sahlberg records a brachypterous specimen taken in Finland by Reuter. At the South London Entomological Society, however, Kirkaldy exhibited on December 12th, 1901, a specimen of *Nabis ferus* which had " one side macropterous and the other brachypterous." Unfortunately no further particulars are given in the " Proceedings " of the Society, but one would feel inclined to think that this was a case in which, perhaps, through some accident just prior to the last ecdysis, the side described as brachypterous may have failed to become properly developed, a malformation which sometimes happens in Coleoptera. Puton states that, in the north of Europe, a form is found, though rarely, with shorter membrane, which has no discoidal cells and has fewer nervures, in which condition it approaches the appearance of *N. rugosus*, from which it differs, however, by having the membrane always broader than the corium, and the anterior femora shorter; possibly this may be the form mentioned by Sahlberg.

Distribution. This insect inhabits a very wide area. It occurs throughout both Palaearctic and Nearctic Regions, and, in fact, seems in a fair way to become cosmopolitan. From Britain the records are fairly complete; it is recorded from thirty-one English counties, i.e. practically all that have been specially worked for Hemiptera. The only exceptions are at present Westmorland, Staffs, Derby, Salop, Worcester, Rutland, Beds, Northants, and Monmouth. In Wales, the only counties that have yet yielded it are Glamorgan and Carmarthen. It is recorded also from the Isle of Man, the Scilly Is., Scotland, and Ireland.

194. **Nabis rugosus** L. (subg. Nabis or Reduviolus Osh. Cat.).

Lin., S.N. 442 (1758); D. & S., B.H. 552 (1865) (dorsalis); Saund., H.H.B.I. 171 (1892).

Ova. Eggs removed from the body of a ♀ taken May 12th, 1917, are similar to those of *N. major* (q.v.), but smaller and narrower, and the bend towards the anterior end is not quite so pronounced. In all, thirteen eggs were removed, but these were not all quite fully developed.

Larvae. Last instar, 6 mm. Body fusiform, ochreous or greyish-ochreous, with a thin central red streak, which becomes brownish behind; at a little distance on each side of this is an indistinct fuscous streak, leaving outwardly a broad ochreous area, including the connexivum; wing-pads reaching to third abdominal segment; all the surface more or less shortly pubescent; legs ochreous with rows of dark spots on the femora; tibiae with long pale hairs; tarsi as usual, and dark at apex; antennae ochreous, very slightly infuscated at apex; rostrum extending to middle of intermediate coxae.

Life-cycle. The imago is found from February to October. It matures late in August, and therefore apparently hibernates as imago, the spring specimens being over-wintered ones. Some of the eggs referred to above appeared to be almost ready for laying, which would make the time of deposition about the end of May; larvae are found during June and July and in the early part of August.

Habitat, etc. It is found at the roots of plants, especially on hedge banks, but it is also taken by sweeping. Schumacher records it from under *Calluna* in Germany. Although, or perhaps because, this insect is so common, there are no records indicating the nature of its food or its method of life.

This is a curious insect as regards the degree of development it reaches in its final condition. All parts of the hemielytra are always present, but in varying degrees. There is not much difference in the clavus, but the membrane sometimes extends considerably beyond the end of the abdomen, and at others only a little beyond the apex of the corium. When the membrane is most fully developed, the corium also is lengthened, its costal margin becomes less rounded and its apex more acute, and the quadrate area which is found at its inner angle becomes more elongated. But even when the membrane reaches its greatest development, there is still scarcely any trace of discoidal cells, so that one must assume that it is still imperfectly developed. This view is confirmed by the fact that the wings, even when the membrane is at its largest, are still quite rudimentary, although a little larger than when the membrane is smallest. In my own collection almost all the specimens with longer membrane are ♂♂, and I have no short-membraned ♂. Between the two extreme conditions, there are various intermediate states.

Distribution. On the Continent it is of general distribution. It extends also into Algeria and Siberia. In Britain also it is generally distributed, being recorded from all the English counties except Northumberland, Westmorland, Staffs, Derby, Salop, Worcester, Rutland, Hunts, Beds, Northants, and Monmouth, in all twenty-nine counties; from Wales the records are from Carnarvon, Glamorgan, and Carmarthen; it is found also in the Isle of Man and the Scilly Is., and in both Scotland and Ireland.

195. **Nabis ericetorum** Scholtz. (subg. Nabis or Reduviolus Osh. Cat.).

Scholtz. Arb. u. Ver., 113, 3 (1846); Saund., H.H.B.I. 171 (1892).

Ova. Undescribed.

Larvae. An early instar, 2¾ mm., probably the second, may be thus described: Body fusiform, with prominent eyes; colour reddish ochreous, with ochreous legs and antennae, the former with a fringe of fine hairs beneath the anterior femora, and parallel to them a row of large black dots from each of which springs a long yellowish hair, and the latter slightly infuscated. A broad dark streak down each side of the body, and a thin red one down the middle. There are a few long erect hairs on the upper surface of the body; the intermediate and posterior tibiae are also furnished with closely set and rather long hairs, and there are a few scattered ones on the femora above. The anterior tibiae have a row of black thorn-like hairs behind.

Last larval instar, 5½ mm., very similar to that of *N. rugosus*, but much darker, the ochreous being replaced by red, and the dark markings being more extensive. Otherwise the description of *N. rugosus* may be taken as applying to this species.

Life-cycle. The imago matures chiefly in August and may be found from that month till October; it has also been found in February, April, and June, and on the Continent in July. These records seem to imply that the insect hibernates as an imago. Some specimens mature much later than the generality; two of the above-described small larvae were found in August; they cannot have been hatched much before the end of July, and would probably not mature before the end of September. The period of maturation for the majority coincides with that of the fullest development of the *Calluna* with which it is so closely associated.

Habitat, etc. This species occurs only on heaths, under *Calluna* and *Erica*, where it is usually abundant. It shows the characteristic red-black coloration of a heath insect. In such positions it would be well supplied with food. The Hemiptera *Orthotylus ericetorum*, *Scolopostethus decoratus*, and *Ischnorhynchus geminatus* would be pretty sure to be present, together with certain Lepidopterous larvae, such as *Anarta myrtilli* and certain Geometrae, the Coleopteron *Lochmaea suturalis*, a *Haltica*, and various *Poduridae*, if those would not be too small. There are, however, no records of its actual feeding.

It is very closely allied to *N. rugosus*, and shows a similar variety in the development of the membrane, all the forms being truly brachypterous, that is to say, with the wings rudimentary.

Pale specimens of this species often very closely resemble dark specimens of *N. rugosus*, but I believe these can always be distinguished by their narrower form, slightly shorter antennae, especially the second joint, and slightly shorter anterior femora.

Distribution. It is pretty generally distributed on the Continent, and occurs also in Algeria and Siberia. In Britain it is found in the coast counties from Northumberland round to Dorset, except Durham, and also in Cumberland, Westmorland, Cheshire, Derby, Notts, Warwick, Oxon, Bucks, Surrey, Berks, and Cornwall; in Wales only two counties are yet mentioned as habitats, Carnarvon and Carmarthen. It is found in both Scotland and Ireland.

196. **Nabis brevis** Scholtz. (subg. Nabis or Reduviolus Osh. Cat.).

Scholtz. Arb. Ver. Schles. 113 (1846); E.M.M., xxxvi, 227.

N. brevis may be distinguished in both sexes from *N. rugosus* L. and *N. ericetorum* Scholtz by its smaller size and shorter anterior femora, which are much shorter than in *rugosus*, but only a trifle shorter than in *ericetorum*; in colour it differs from both species, being a darker, greyer insect than *rugosus*, having all the nerves of the elytra widely margined with fuscous-grey, the underside also darker and often nearly black, and the transverse black bars on the anterior femora beneath much more pronounced and often coalescing; in these respects it resembles *ericetorum*, but there is no tendency to become rufescent, as there is in that species; and it is an inhabitant of marshy districts, whereas *ericetorum*, as its name implies, is a heath-loving form; besides the above characters, all the species differ in the form of the genital styles of the ♂; in *brevis*, the blade of the style is wider in proportion to its length, with a more convex upper margin, which rises from the stipes in a nearly straight line; in *ericetorum* there is a shoulder just above the stipes, which is followed by a slight sinuation; in both the apex is mucronate; in *rugosus* there is no shoulder or subsequent sinuation, but the blade is narrower than in either of the others, and the mucro at the apex scarcely developed (Saunders, 45).

Ova. Undescribed.

Larvae. An early instar, 2¾ mm., probably the second. The description of the corresponding stage of *N. ericetorum* will apply equally to this, save that the antennae are slightly shorter, the hind tibiae slightly curved, the anterior tibiae have outstanding hairs like the other two pairs, and the black, thorn-like hairs behind them are on a smaller scale.

Life-cycle. The imago has been found in Britain in August and September, and on the Continent in May, June, July, and November as well.

Habitat, etc. In this country this insect has been found only in marshy, heathy ground, where it has been taken by sweeping and by searching at roots. According to Puton, it should be looked for on marshy ground on which grow *Juncus*, *Carex*, *Eriophora*, etc., and Dalla Torre mentions that it occurs on *Umbelliferae*. Reuter says that it usually hunts in meadows, but he found one specimen in November on *Pinus sylvestris*. Fieber says that *N. brevis* is found all the year round under dead leaves and on different plants, but as he assigns a much larger size to his insect it is doubtful whether he is speaking of the one now under review. It has the same peculiarity in the development of the membrane as the two preceding species, and is thus really brachypterous.

Distribution. It is found in Northern and Central Europe, in the former reaching 66° 40′, and its area extends into Siberia and Algeria. In Britain it has thus far occurred in one county only, viz. Surrey, where both Mr. E. Saunders and I have taken it at Byfleet, and Mr. Saunders at Woking also.

Family XI. **SALDIDAE** (Acanthiidae Osh. Cat.).

These insects have a most distinctive facies, being of a flat oval shape, and either entirely black or black more or less chequered with white or pale ochreous. They have very prominent eyes, and the membrane is usually in only a partially developed condition, so that the brachypterous and macropterous forms are sometimes very unlike. They live chiefly in damp places such as the margins of ponds and rivers, wet moors, and mud-flats on the sea-coast. They run on the ground, and are extremely active, running, jumping, and flying with equal agility. Hence they are difficult insects to catch, requiring great wariness, patience, promptitude, and a steady hand, if they are to be secured without damage to their delicate framework, and without becoming soiled with the mud amongst which they so frequently live. Uhler says of the family: "The posterior legs are thrown very far back by reason of the very large and long coxae, and, together with the long femora and tibiae, give them a great facility in vaulting into the air. They use their wings in connexion with this motion, and generally alight several feet from the point of departure. Their motion in running over the ground is often sinuous, while rapid, and their selective adherence to the spots which best agree with their combination of colours may well shield them from the pursuit of enemies." They are not very easily seen when on the ground, and are adepts at hiding themselves under herbage or in the shadow of plants. According to Curtis, they are active in sunshine only; on dull days they lie concealed in cracks in the mud, or under stones. They appear to be carnivorous in habits; according to Latreille, they live chiefly on aquatic insects, and especially on Diptera. Hungerford has kept some species upon a diet of dead flies. The ova of all but a few American species are quite unknown; these American ones are white, elongate-cylindrical, with one end broadly rounded and the other constricted and slightly curved upward; they are laid at the base of tufts of grass or in moss. The larvae have the shape of the adult, and can scarcely be mistaken, though there is difficulty in distinguishing species.

The *Saldidae* have a world-wide distribution, though but few genera are known. Three genera are Palaearctic, but only one occurs in Britain ; this, however, contains a considerable diversity of forms, and has been divided into a number of sub-genera. Of the seventy catalogued Palaearctic species we have nineteen. N. America is particularly rich in species, and many of the Old World forms occur in it.

Dr. Buchanan White once found a *Salda* stranded in a snow-drift in Scotland at a height of 4000 feet.

197. **Salda pilosa** Fall. (Acanthia id. Osh. Cat. subg. Chiloxanthus).

Fall. Mon. Cim., 29, 3 (1807) ; D. & S., B.H. 518 (1865) ; Saund., H.H.B.I. 174 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken from May to August.

Habitat, etc. This species frequents salt marshes by the sea-coast exclusively.

Distribution. This is a rather local species. It occurs in the northern and central parts of Europe, and also in Siberia. Its area reaches the parallel of 67°. In Britain it has been found in ten English counties, viz. Cumberland, Durham, Lancs, Lincs, Norfolk, Suffolk, Essex, Kent, Devon, and Somerset. It is therefore to be sought for chiefly on the East Coast, in some parts of which, e.g. Durham, it is common. It is not recorded from either Wales, Scotland, or Ireland.

198. **Salda littoralis** L. (Acanthia id. Osh. Cat. subg. Sciodopterus).

Lin., F.S. 246, 915 (1761) ; D. & S., B.H. 528 (1865) ; Saund., H.H.B.I. 177 (1892).

Ova. Undescribed.

Larvae. An early instar, $1\frac{3}{4}$ mm., probably the second. Oval, shining, pitch-black with the legs lighter and base of abdomen red at each side ; legs and antennae with a few stout black hairs ; the three thoracic segments very distinct, the first the longest, but all strongly transverse ; the first and third with discal impressions ; antennae four-jointed ; tarsi two-jointed, basal joint very short ; abdomen punctured in the neighbourhood of the scent-glands, otherwise laevigate ; a few stout black bristles on head.

Next instar, 3 mm. Similar to the above, but with mesonotum longer ; each thoracic segment has a stout black bristle, backwardly directed, at each posterior angle.

Next instar, 4 mm. Entirely black, shining in most parts ; very stout black bristles to legs, intermixed with finer hairs ; pronotum with lateral margins foliaceous and strongly reflexed, the hollow surface dulled with minute tubercles ; mesonotum proportionately larger than previously and showing beginnings of wing-pads as a backwardly directed triangle on each side, the part between them (representing the scutellum) bluntly angular in outline outwardly; two foveae on each side near base of wing-pads; surface of latter dulled by minute tubercles, the whole largely overlapping metanotum; surface of abdomen shining, with faint irregular wrinkles; a few short bristles springing from between facets of eyes; underside of abdomen ochreous in centre of first four segments and part of fifth, with three longitudinal rows of black spots, the centre spots transverse.

Last instar, 5 mm. Similar to the preceding, but with wing-pads larger and dull through fine tuberculation. The shining, glabrous abdomen black above and centrally ochreous below will easily distinguish the species. It is curious that this ochreous colour below entirely disappears at the last moult, and the imago is entirely black.

The cast skin is opaque and entirely black, as dense in colour as the larva that cast it.

Life-cycle. The imago has been found from May to August. I have taken young larvae in the second instar in the middle of May, and in the same locality others which had just matured by the end of June. Thus it would appear that the duration of larval life is about two months. But as larvae of different ages are met with at the same time, there is apparently a succession of imagines during June and July, probably resulting from a succession of ovipositions, and by the end of the latter month most, if not all, have matured. If this be so, then possibly such few adults as are found in May and early June may be survivals from the preceding year, but this seems rather unlikely, as there are no records of the occurrence of the imago outside the above mentioned four months.

Habitat, etc. This insect is found in salt marshes on the sea-coast, but it is not, like the preceding species, confined to such localities. It occurs also on the margins of fresh-water lakes, such as Ulleswater (Murray) and Lough Neagh in Ireland; it is, moreover, recorded from many inland localities. On the salt marshes it runs about under the characteristic plants of these places, such as *Salsola, Atriplex portulacoides*, etc. By the side of lakes it lurks amongst the stones, as well as amongst any herbage that may be near. According to Curtis, it has also been found under fuci and other rejectamenta on sandy seashores. J. E. Mason reports it as abundant on the dried-up bed of a delph in Lincolnshire, among reeds in July.

Distribution. This insect has a very wide area, extending over Europe, passing over into Siberia, and appearing again in Canada and the United States. It reaches 70° N. lat. In Britain it is recorded from the coast counties extending from Northumberland to Cornwall, except Durham, where its place seems to be taken by *S. pilosa*, and from Cumberland, Lancs, Cheshire, and Cambs; from Wales there are records from Carnarvon and Glamorgan; it occurs in both Ireland and Scotland, including the Orkney and Shetland Islands.

199. **Salda oculata** Müll. (Acanthia muelleri Osh. Cat. subg. Sciodopterus).
Müll. Zool. Dan., 105; E.M.M. xxxi, 236.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in June and July.

Habitat, etc. This is an inland species, occurring on moors, commons, lake-sides, etc. McGregor (3) says of this insect: " In the sunlight the insect is of a bright bronze-blue colour and is sluggish in habit, making no attempt to leap or fly like our *S. scotica* and many other species of *Salda*, which are so difficult to capture. The specimens seemed to avoid open places, and were only found by careful searching at the roots of the grass." Halbert obtained it in Ireland on a boggy heath.

According to Oshanin's Catalogue, the description of the ♀ under *S. morio* in Saunders' " Hem.-Het. Br. Is." refers not to *S. morio* but to the present species, while the description of the ♂ belongs to the true *S. morio*.

This species is closely allied to the following, and may be distinguished by the following characteristics: Black, surface not very shining, hemielytra distinctly and somewhat closely though irregularly punctured on disc; eyes in ♂ larger, each being decidedly wider than interval between them; thorax wider, less constricted in front, its sides less straight. Its macropterous form is very rare and has apparently not occurred yet with us.

Distribution. This insect inhabits Europe, Turkestan, and Siberia. In Britain there are at present but few records for it; it has occurred in two English counties, Yorks and Norfolk, and possibly in a third, but it is uncertain whether Mr. Dale's captures at Whittlesea Mere were this insect or the next one. It has also been taken in both Scotland and Ireland; the former is at present the chief centre for it. In Scotland it has occurred at a high altitude.

200. **Salda morio** Zett. (Acanthia id. Osh. Cat. subg. Sciodopterus).
Zett. Ins. Lap. 267, 3 (1840); Saund., H.H.B.I. 178 pars. (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Shining black, glabrous; wing-pads and explanate margins of pronotum shagreened, brownish; legs brownish, becoming pitchy in the tibiae and tarsi; antennae pitchy; connexivum brownish, claws and rostrum pale brownish; disc of pronotum elevated, with a transverse impression in centre, sides straight, diverging; basal tarsal joint very short, terminal very long, intermediate and posterior tibiae with an outward and an inward row of black spines; first two antennal joints with long black setae; superficially resembling *S. littoralis* but with straighter margins to pronotum, longer and more slender antennae, and colour differences as indicated.

Life-cycle. On the Continent this species has been taken as an imago from June to September, and in England in August.

Habitat, etc. This insect appears to inhabit high moorlands. According to Oshanin's Catalogue, the description of the ♂ only in Saunders' "Hem.-Het. Brit. Is." refers to this species. It may be distinguished from the preceding as follows: Black, its surface very shining, almost as if burnished; puncturation of hemielytra obsolete, or nearly so; eyes in ♂, although large, not or scarcely wider than the interval between them; thorax narrower, more constricted in front, its sides straighter. The macropterous form is very rare, and apparently has not yet been found with us.

Distribution. This is a rare species and has a restricted distribution. It is recorded from Iceland, Northern and Central Europe, and Siberia, besides Great Britain. Its distribution in our own country is difficult to state accurately, because of the confusion that for some time existed between this species and the preceding. The present species has certainly been taken in Northumberland, Cumberland, Durham, Derbyshire, and Ireland. As to Scotland there are some doubts.

201. **Salda marginalis** Fall. (Micracanthia id Osh. Cat.).

Fall. Mon. Cim. 30, 4 (1807); D. & S., B.H. 524 (1865); Saund., H.H.B.I. 180 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from May to October.

Habitat, etc. This little species inhabits damp spots on heaths. It is usually rare, but Mr. H. A. Saunders has found it in considerable numbers in a damp hollow on a heath at Studland, Dorset. He thought that the explanation of the great numbers found was that the insects had been confined to the one spot by the hollow shape of the ground, which prevented their escape, so that they bred season after season in a small area, with no possibility of spreading, and hence multiplied much more than usual. He was fortunate enough to breed several specimens from the larvae, and this he did by keeping them on damp moss growing on a turf. They hid under the turf. He did not see them take any food, but supposed they might have fed upon the moss.

Distribution. This is a rare and local species. Besides our own country, it has been found only in Sweden, Holland, Finland, and Siberia. In Britain it has occurred in three counties only, Surrey, Dorset, and Norfolk.

202. **Salda riparia** Fall. (Teloleuca pellucens Osh. Cat.).

Fall. Hem. Suec., 72, 2 (1829); Saund., H.H.B.I. 175 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken from June to August.

Habitat, etc. Marshall describes it as occurring in wet places on the moors and on the mountain sides. It can be distinguished from the allied species by its very narrow and quite straight-sided pronotum. The yellow spot on the hemielytra varies in intensity and size, and is often quite as evident in *S. scotica*, which has a much broader pronotum with somewhat rounded sides.

Distribution. This insect inhabits Europe and Siberia, reaching a northern limit of 69°. In Britain it is very local, and thus far has been recorded only from Cumberland and Durham, from Snowdon, and from Rannoch and Aviemore in Scotland.

203. **Salda scotica** Curt. (Acanthia id. Osh. Cat.).

Curt. B. E. xii, 548, 12 (1835) ; D. & S., B. H. 530 (1865) (riparia) ; Saund., H.H.B.I. 177 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to September.

Habitat, etc. This species inhabits the beds of mountain streams, where it runs with great agility on and amongst the rocks and boulders. It is exceptional amongst the *Saldae* in having the membrane always fully developed.

Distribution. On the Continent it is recorded from Scandinavia, France, Germany, and the Caucasus, and its area extends into Siberia. It reaches the parallel of 68° N. Its distribution is necessarily limited by the nature of its habitat, and in Britain it is almost confined to Wales, the northern counties of England, and Scotland. It occurs in all the six northern counties of England as well as in Cheshire, Salop, and Notts ; it is found again in Devon, and in Wales it has been recorded from the counties of Carnarvon, Brecknock, Carmarthen, and Glamorgan. It is found also in both Scotland (counties of Perth, Forfar, and Inverness), and Ireland (Belfast and Newcastle). Curtis records it from the Isle of Bute.

204. **Salda orthochila** Fieb. (Acanthia id. Osh. Cat.).

Fieb., W.E.M. iii, 234, 6 (1859) ; D. & S., B.H. 521 (1865) ; Saund., H.H.B.I. 176 (1892).

Ova. Unknown.

Larvae. 3 mm. (a late instar, probably the penultimate). Body broad oval, yellowish, more or less clouded with indefinite smoky shades ; the whole surface very closely and minutely punctured, so that it appears almost as if shagreened ; pronotum transverse, its sides straight and sloping, wing-pads extending nearly to end of second abdominal segment ; the whole surface with rather short and stout scattered hairs ; a few stout bristles on the face, chiefly on the clypeus ; tibiae and antennae with stout bristles ; tarsi two-jointed, basal joint very short, claws long. The facets of the compound eyes present a curious appearance as if each had a slight prominence in the centre ; the same structure occurs in the adult. There is a small, clear, shining spot just inside the margin of each eye, which might easily be thought to be ocelli, but that one does not expect ocelli in a larva, and that they are not in the right position ; in the adult also they occur, and the true ocelli are on a prominence between them.

Life-cycle. The imago has been found from June to October, and also in March and April. The above larva was found in August in Snowdonia.

Habitat, etc. This species usually frequents drier places than the majority of its congeners, and is especially partial to sandy spots, such as sandpits, sandy commons or heaths, sandhills, etc. Parfitt, however, found specimens under stones in wet or damp places which were reached by high tides. On heaths it occurs both on the bare patches and under *Erica*, and it has been met with also in chalk-pits. Dalla Torre speaks of finding it on *Dianthus deltoides*, and Morley (4) once on *Epilobium hirsutum* ; but these are probably merely casual occurrences. J. E. Mason records finding one by a roadside in Lincolnshire, and Carr reports it on flagstones in a village.

It is a species that might easily be mistaken in the field for *S. saltatoria*.

Distribution. It is distributed throughout Europe and extends into Turkestan and Siberia, reaching the parallel of 69°. In England it has occurred in all the coast counties from Northumberland round to Glo'ster, except Essex, and also in Cumberland, Lancs, Cheshire, Staffs, Notts, Hereford, Surrey, Berks ; in Wales the records are from Denbigh, Carnarvon, Anglesey, Merioneth, Carmarthen, and Glamorgan. It is found also in both Scotland and Ireland. In our area it extends as far north as the Shetlands.

205. **Salda saltatoria** L. (Acanthia id. Osh. Cat.).

Lin., F.S. 964 (1761) ; D. & S., B.H. 522 (1865) ; Saund., H.H.B.I. 180 (1892).

Ova. Unknown.

Larvae. A larva taken at Lymington in its last instar may possibly represent this species. It is almost uniformly of a yellowish-grey colour with black eyes ; a rather elongate oval, with wing-pads extending rather more than half-way down the body, and legs rather longer than those of *S. pallipes*. Length $2\frac{3}{4}$ mm.

Life-cycle. The imago is to be found practically all the year round. I have records for all the months except November. Although this is such a common species I have little information to show when the young are produced. The above larva was taken in August.

Habitat, etc. This species is usually common in marshy and muddy places, and on the margins of ponds, ditches, lakes, and rivers, in all which places it runs with great agility. Though more of an inland species than *S. pallipes*, it is also found on the coast, in salt marshes. In these, according to J. E. Mason, it affects the mud less than *S. pilosella*. According to the same observer it is able to exist submerged for some time ; referring to an experience on a tidal mud-flat at Lelant Harbour, W. Cornwall, he writes: "I watched one (*S. saltatoria*) until the receding tide left it after near an hour's submergence ; so long as its body and surroundings were wet, it showed nothing of its usual wariness and activity, and was easily taken up with the fingers."

This species is with us probably the commonest and most widely distributed of the genus. According to Douglas and Scott it is found in the winter in moss on damp walls, etc. Hallett took a specimen under oak-bark in December. Curtis records it from "under flower-pots in Mr. Dale's garden." Many of its vars. are much like those of *S. pallipes*, but apart from the slight difference in habitat, they can be safely distinguished by the fact that the dark line down the fore tibiae is always divided into three parts.

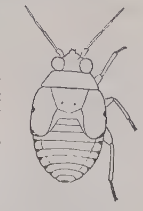
Distribution. It is generally distributed on the Continent and extends its area into both Palaearctic Africa and Siberia. It occurs also in the Nearctic Province. Its name is included in almost all British published lists, thirty English counties altogether, i.e. all except Westmorland, Derby, Salop, Leicester, Rutland, Hunts, Beds, Northants, Bucks, and Monmouth. From Wales the records are Carnarvon (Willoughby Ellis), Merioneth (Blatch), and Glamorgan (Hallett). It is found in both Scotland and Ireland. J. E. Mason also records it from the Isle of Man.

206. **Salda C-album** Fieb. (Acanthia id. Osh. Cat.).

Fieb., W.E.M., iii, 236, 10 (1859) ; D. & S., B.H. 525 (1865) (stellata) ; Saund., H.H.B.I. 178 (1892).

Ova. Unknown.

Larvae. I obtained a number of nymphs amongst boulders in the bed of the river Wye, at Breinton, Herefordshire. They measured from 2½ to 3 mm. in length. Body broad oval, with the wing-pads somewhat projecting ; colour yellowish, more or less deeply tinged with brownish or piceous which produces a prettily variegated pattern ; the chief of these darker markings are a pair of angulated stripes on the face, a pair of indefinite patches on the vertex, separated by a yellow line, the hinder angles of the pronotum, and frequently a basal transverse streak as well, two small central spots on the scutellum, and frequently others at its margins and base ; the base and apex of the wing-pads, and an irregular patch on the middle of the lateral margin ; four more or less vague spots on each abdominal segment which generally coalesce more or less to form a band ; the marginal junctions of the segments ; these markings often spread so much as to cover all the body except a few light spots here and there ; opening of scent-gland black, with a red spot in front of it and a very pale whitish one behind it ; two foveae a little in front of the position which will ultimately be occupied by the ocelli, and this latter shows two red shining spots which are the rudiments of the ocelli ; pronotum very transverse, with straight sloping sides, and



Nymph of *Salda C-album.*

truncate behind; marginal outline of abdomen sinuous, the junctions of the segments falling a little within the general outline; the whole surface very minutely and closely punctured, so that it is dull and appears almost as if shagreened; the rudiments of the yellowish **C** which is such a characteristic of the adult always plainly visible as a light area surrounding the median marginal spot on the wing-pads; legs yellowish, sometimes rather dulled with a brownish tinge, hind tibiae with a pale ring before the apex; these latter usually slightly curved outwards.

Life-cycle. As with the preceding species the imago occurs practically all the year round; I have records for every month except December. The larvae above described were taken in August and were then nearly full-grown; there were in fact many imagines with them. This seems to point to about the beginning of June for the hatching of the eggs, but nothing is known as to the time of their deposition.

Habitat, etc. This is exclusively a river species, occurring in the same way as *S. scotica*, amongst the boulders and rocks in mountain streams or others with rocky beds, as well as on shingle by river-sides. When pursued the insects delight to retreat into the crevices in the rocks or between the boulders, and their dislogdment is not easy. The golden pubescence shows much more plainly in nature than in the cabinet especially when the sun shines, so that the insects look much paler as they run over the bare rocks than when arranged in a cabinet drawer.

S. C-album is almost always brachypterous with abbreviated membrane, and so has a very rounded appearance; *S. vestita* D. & S. is the macropterous form of this species. Saunders treated it originally as the developed form of *S. saltatoria*, but was convinced by the following experience of Mr. Newbery that Reuter's association of it with *S. C-album* was correct: " Among a large number of *Salda C-album* sent to me for examination by Mr. Geo. B. Routledge, were three or four specimens of *vestita* D. & S. Upon enquiry I find that they were all taken at one spot on the banks of the Irthing, near Edmond Castle. *Salda saltatoria* did not occur at all, the only other species being *scotica* Curt. I have before received *C-album* and *vestita* from Mr. Routledge taken together elsewhere, and think these facts are a very strong confirmation of Dr. Reuter's opinion that *vestita* is the developed form of *C-album*."

Distribution. Generally distributed in Europe, and extending its area into Turkestan and Siberia, this insect is recorded in England from the northern counties of Northumberland, Cumberland, Durham, Yorks, and Cheshire; from the midland counties of Derby, Notts, Warwick, Worcester, Hereford, and Glo'ster; and from the southern counties of Hants, Dorset, Somerset, Devon, and Cornwall. In Wales it is recorded from Denbigh, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland, as well as in the Isle of Man.

207. **Salda opacula** Zett. (Acanthia id. Osh. Cat.).

Zett. Ins. Lap., 268, 8 (1840); Saund., H.H.B.I. 179 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The only information I have on this point is Flor's observation that the imago was taken in July.

Habitat, etc. This species appears to be of some rarity, and I have no information as to its habits save Flor's statement that it is found in marshes and on the banks of pools, and Morley's (4) that it has been taken on the banks of brackish ditches.

Distribution. It is generally distributed throughout Europe and in Siberia, though apparently rare, and is also found in N. America. Its northernmost extension is 69°. In Britain it has been recorded only from Norfolk and Suffolk in England, and from Braemar, Aviemore, and Forres in Scotland.

208. **Salda setulosa** Put. (Acanthia id. Osh. Cat.).

Put. Syn., i, 197; E.M.M. xl, 275.

S. setulosa is closely allied to *S. opacula* Zett. The chief differences are as follow: head, pronotum and hemielytra densely pilose, being clothed with long, upright, blackish hairs: the pale markings on the face which are so characteristic of *opacula* much obscured with black; second joint of antennae flavous with darkened base and apex, and longer than in *opacula*; and the line of demarcation between the flavous lateral margin of hemielytra and the darker ground-colour not so distinct, especially towards the apex, where the pale colour extends inwards and encloses a white spot. In Puton's "Synopsis" *S. setulosa* is treated as a var. of *S. opacula*, but Reuter regarded it as a distinct species, and in this he was undoubtedly right; in fact, Puton himself treated it as distinct in the last edition of his Catalogue; it differs from *opacula* pretty much as *pilosella* differs from *pallipes*, and these are now recognised as distinct.

Ova. Unknown.

Larvae. There were larvae with the imago which I discovered on Poole Harbour, but unfortunately I did not secure any and have therefore no description to offer.

Life-cycle. The only British specimen of the imago which has thus far been obtained I took in August, 1904, and there were with it nearly full-grown larvae, probably of the same species; I was apparently rather early for it, as there were no more imagines to be found. No other information on the life-cycle is available.

Habitat, etc. The above specimen, which is a ♂, I took amongst flood refuse on the southern side of Poole Harbour, Dorset, the locality being a sandy area on a marsh.

Distribution. Apart from the British record, this little species is reported only from the South of France, Morocco, and Turkestan. The sole British record is from Poole Harbour, Dorset.

209. **Salda pilosella** Thoms. (Acanthia id. Osh. Cat.).

Thoms. Opusc. Ent., iv, 407 (1871); Saund., H.H.B.I. 181 (1892).

Ova. Unknown.

Larvae. I have a few larvae kindly sent me by Mr. C. Morley from a salt marsh at Covehithe, Suffolk, which I think must belong to *S. pilosella.* They are very much like those of *S. C-album,* described ante (p. 295), but are rather smaller, measuring from 2 to 2½ mm., and less rounded at the sides, so as to be of a longer oval shape; legs and antennae rather shorter, especially the second joint of the latter; there is the same dull surface caused in the same way, by minute and close puncturation; the same yellowish colour shaded with brownish, but with the pattern not so distinct; facial foveae deeper, and pronotum with the sides less divergent, and with an anterior as well as posterior furrow, the latter further from the truncated base. In both cases the surface is thinly covered with short and rather stout black hairs, which are not very easy to see.

Life-cycle. The above larvae were taken in the third week in September, 1910; larvae have also been found in August, in which month in 1898 the majority of the specimens, in a marsh near Weybourne, Norfolk, were in that condition. The imago is taken from July to October, but these records give very little clue to the complete cycle.

Habitat, etc. This species occurs chiefly in salt marshes, where it runs on the mud near the salt water, or flies and settles on such plants as *Salicornia,* etc., from which it may be obtained by sweeping. But it occurs also on the banks of some of the Broads in the Eastern Counties. In the Weybourne marsh above referred to, this insect was in company with *Nabis lineatus* and *Teratocoris antennatus.*

Distribution. This species is reported from Northern and Central Europe and from Northern Turkestan. In Britain the records are from nine counties only, viz. the coast counties from Yorks to Hants, except Essex, and from Somerset and Devon. There are no records from either Wales, Scotland, or Ireland.

210. **Salda pallipes** Fab. (Acanthia id. Osh. Cat.).

Fab., S.R. 115, 12 (1803); D. & S., B.H. 527 (1865); Saund., H.H.B.I. 181 (1892).

Ova. Unknown.

Larvae. I have a number of small larvae taken on the Lymington Salterns, where this species is abundant; as they belong apparently to the first three instars, it is difficult to be at all sure as to their specific identity, and I place them here only provisionally. They measure about 1 mm., 1½ mm., and 2 mm. respectively. They are of a uniform brown colour, and are slightly shining, although covered with the usual extremely minute and close puncturation. In the first two, the three thoracic segments are strongly transverse and similarly shaped, save that the lateral margins of the meso- and metanotum are slightly rounded, so that the outline is indented at their junction. The basal abdominal segment has a pale lateral spot on each side. The hind tibiae have a few strong black bristles, which are specially distinct in the second instar. In the third instar, the wing-pads begin to appear, and this causes the mesonotum to be prolonged laterally into two sub-triangular flaps, which overlap two-thirds of the metanotum; the prolongations of the latter are much less marked, so that the posterior margin is only slightly emarginate; the extremities of these metanotal flaps are angular.

Whatever may be the identity of these young larvae, there is no doubt about the last instar, 2½ mm. These are sometimes entirely black, and sometimes have an ochreous spot about half-way down the connexivum, with some indistinct pale streaks upon the wing-pads, the extremities of which project a little beyond the general outline of the body; pronotum transversely impressed behind, and with a deep fovea on each side posteriorly; front tibiae with a dark streak more or less traceable for about two-thirds of its length.

Referring again to the early instars above, the only other species that occurred on the spot was *S. lateralis*, but for so differently shaped an adult, I should have expected some indications of this even in these young larvae, hence I scarcely think they can be *S. lateralis*.

Life-cycle. The imago has been found from April to September, and also in February. The above young larvae were found in May, and those in the first instar had evidently not long been hatched. The record for February shows that some imagines at least survive the winter.

Habitat, etc. This species also belongs to salt marshes, and is often found in company with *S. pilosella*, a species which, superficially, bears a close resemblance to some of its varieties. Douglas and Scott (1) give "on the banks of pools of brackish water, Deal; and Morley (4), "brackish ditches on the coast, sometimes under seaweed." At Hythe, on Southampton Water, I have found it amongst the maritime grass *Spartina stricta.* The above young larvae were difficult to distinguish as they ran about on the mud, since the colour was identical with that of the ground.

Distribution. *S. pallipes* is generally distributed in suitable localities in Europe up to 69°; it is found also in Algeria, Turkestan, Persia, and Siberia, and extends its area into America, both Nearctic and Neotropical, where it has been taken at a height of 9500 ft. in Colorado (Hungerford). Its British records are rather scattered, and probably represent but a fraction of its true distribution. They are as follows: Northumberland, Cumberland, Durham, Cheshire, Leicester, and all the coast counties from Norfolk to

Cornwall, together with Middlesex. As for Wales, Hallett has found it in Glamorgan and I have taken in Carmarthen. It is found in both Scotland and Ireland. The record from Leicester is curious, as one would hardly expect this insect from localities so far inland.

211. **Salda arenicola** Scholtz. (Acanthia id. Osh. Cat.).

Scholtz., Arb. und Ver. Schles. Ges., 6 (1846); Saund., H.H.B.I. 182 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in August and September, and on the Continent in May and June.

Habitat, etc. Douglas says that it is found at damp spots where the clay strata lie just beneath sandy ones, and that it is exceptionally difficult to catch, because it flies rather than leaps, as most other *Saldae* do.

Distribution. Though generally distributed in Europe and extending even into Algeria and Siberia, this species has in Britain occurred in two counties only, viz. Surrey and Hants. The latter appears to be its headquarters, for it has occurred at Bournemouth (Capron), Portsmouth (Moncreaff), and in the Isle of Wight (Saunders). The only record for Surrey is Shere, and the authority is Capron. There is a series of this insect in the collection left by Dr. Capron, which through the kindness of the late Mr. E. Saunders is now incorporated with my own; but unfortunately Dr. Capron attached no localities to his captures, and there is nothing to show whether these specimens are what are referred to above as taken at Bournemouth, or whether they, or any of them, are really from Shere, where Capron lived. In these circumstances, the Surrey record seems a rather doubtful one.

212. **Salda lateralis** Fall. (Acanthia or Halosalda id. Osh. Cat.).

Fall. Mon. Cim., 30, 4 (1807); D. & S., B.H. 519 & 520 (pulchella) (1865); Saund., H.H.B.I. 175 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is taken from May to October, and the macropterous form has been found in June (Morley, 4).

Habitat, etc. This species belongs to the salt marshes and mud-flats by the sea-shore, where it runs about on the mud amongst the maritime plants. It is a most wary insect, and difficult to approach and it jumps well. It is able to endure immersion for a time. J. E. Mason (3) thus writes of this species as he observed it at Lelant Harbour, W. Cornwall: "*S. lateralis* was plentiful when spring tides covered the mud for more than two hours at a time. As the result of many observations, it appears that, on feeling the flowing water, the *Salda* appresses its femora to the body, and fixes itself along a stem or a blade of grass, which it firmly holds to. In cases where the place was for some reason left for another, I noticed the insect slowly crawl on the mud, under the water, to a fresh plant; now and again it happened that the water, suddenly coming in, took the *Salda* unawares, and bore it up on the surface; but it kept there no longer than until it got hold of a stem or a blade, down which it slowly crawled, till near the mud, and there remained."

The species almost always has the membrane abbreviated, though not greatly so; the macropterous form, which very rarely occurs, looks very different from the brachypterous, chiefly on account of the large membrane.

Distribution. It is generally distributed on the Continent in suitable localities and is found also in Algeria, Tunisia, Transcaucasia, and Asia Minor. In Lapland it reaches 66°. In Britain it is recorded from Cumberland, and from all the coast counties extending from Lincs to Somerset. The only Welsh record is from Glamorgan, and it occurs in Scotland, but is not reported from Ireland. Morley (4) reports a macropterous specimen from Aldeburgh.

213. **Salda cincta** H.S. (Acanthia id. Osh. Cat. subg. Chartoscirta).

H.S. Wanz., vi, 40, t. 194, fig. 598 (1842); D. & S., B.H. 531 (1865); Saund., H.H.B.I. 184 (1892).

Ova. Unknown.

Larvae. With this species we enter upon a new subgenus *Chartoscirta*, and we find quite a different type of larva, distinguished by the prominence of the wing-pads, which project considerably beyond the outline of the abdomen.

Length, $1\frac{3}{4}$ mm. This is a specimen I found in the New Forest; of a shining pitchy colour, tinged with yellow, and with a broad more or less foliaceous yellowish border all round from pronotum to extremity of abdomen; legs and antennae yellowish, the latter somewhat fumose; head large, eyes large and rather prominent, the interocular space being flat with two foveae in front; pronotum transverse with straight sloping sides and a deep central transverse furrow; mesonotum with scutellar area yellowish, and posterior margin slightly convex in the centre and passing at the sides into the two large rounded triangular wing-pads; metanotum emarginate behind and reaching no farther than the end of the superior wing-pads; as this, judging from its size, must be an early instar, it seems strange to find the superior wing-pad already so strongly marked; tibiae inwardly with blackish bristles, tarsi two-jointed, with the usual very short basal joint and long terminal one.

Ultimate larval instar, $2\frac{1}{2}$ to 3 mm. Several specimens which I found in a marshy place at Kenchester, Herefordshire. These are very similar to the earlier instar, save that the wing-pads are longer and project more widely from the body; face deeply furrowed, pronotum with a basal as well as a central furrow, and antennae brown, with the basal joint yellowish.

The shining pitchy body with the broad foliaceous yellow border and the projecting wing-pads will enable it always to be recognised. There is no trace of the neck which is characteristic of the adult, and the pronotum, which is much shorter and broader than in the adult, is placed close up to the eyes; the shape of the pronotum is, in fact, very similar to that of *S. C-album.* There is also no trace of the dark stripe on the hind femora.

Life-cycle. This is another species that is found all the year round in the adult condition. I have records for every month in the year. All the larvae described above were taken in August, even the younger one. There must, therefore, be some little irregularity in the hatching and probably in the laying of the eggs.

Habitat, etc. This species occurs chiefly in damp places under rushes and other herbage, but it is found also by river and pond sides. J. Sahlberg gives *Sphagnum.* It is not often, however, found in the open, as so many of the others are, but chiefly under the shelter of closely growing herbage. Morley (4) mentions it as found on reeds, and Dr. C. R. Billups records it from *Sphagnum.* The above larvae were found amongst *Sparganium,* but there is absolutely no evidence as to the nature of its food.

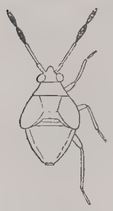
Distribution. Generally distributed on the Continent and extending into Siberia, it also occurs widely in Britain, being included in almost all the county lists; the only English counties for which there is no record are Westmorland, Lancs, Salop, Rutland, Hunts, Beds, Northants, Bucks, and Monmouth; there is only one record from Wales, viz. from Radnor (Blatch), but it is found in both Scotland (Forres) and Ireland (Armagh). It appears to be one of the most widely distributed species we possess.

214. **Salda cocksi** Curt. (Acanthia id. Osh. Cat. subg. Chartoscirta).

Curt., B.E. 348, 10 (1835); D. & S., B.H. 533 (1865) (elegantula); Saund., H.H.B.I. 183 (1892).

Ova. Unknown.

Larvae. The larva in its last instar, 2½ mm., is of a similar shape and structure to that of *S. cincta,* but may be easily distinguished from that by the much thickened terminal joints of the antennae, as well as by other characteristics mentioned below. It is very striking in appearance, having the head, pronotum and abdomen shining pitch-brown, while the meso- and metanotum, including the wing-pads, are bright orange, the latter shaded with reddish-brown on the outer portion; connexivum also and legs yellowish; pronotum both narrower and longer than that of *S. cincta,* and its upper surface clothed with scattered long black hairs; first two antennal joints yellowish, but darker at the base, and the other two deep black; antennae and legs all more or less hairy; face less deeply furrowed than in *S. cincta,* and there are a



Nymph of *Salda cocksi* Curt.

number of rather long black hairs projecting from between the facets of the eyes. There is no more trace of a neck than in *S. cincta*, and the eyes touch the pronotum.

Life-cycle. The imago has been found from January to November. The larva above described was taken in August, but Morley (4) has found them in May. This looks like an indication that the insect is double-brooded.

Habitat, etc. This species is found exclusively in *Sphagnum*. When shaken out of the moss, it often takes up a threatening attitude, with the antennae elevated and pointing somewhat forwards like the horns of a bull. Its movements are fairly active, but not so much so as with most of the species of the genus ; this of course, was to be expected from the nature of the habitat, which, from the closeness of the *Sphagnum* plants, does not leave much space for rapidity of movement. The membrane is more or less short, and looks as if it were abbreviated, though all the cells are present ; nevertheless the wings are fully developed, though they do not appear to be used ; I have never seen the insect take flight.

The larvae have been found in flood-refuse in May (Morley, 4). Curtis named this insect after Mr. Cocks, of High Bickington, who sent him his first specimen in 1835.

Distribution. This insect occurs throughout Europe, and also in Morocco and Siberia ; in Britain it has occurred in all the coast counties from Yorks to Devon, except Kent, as well as in Cumberland, Salop, Staffs, Notts, Leicester, Warwick, Worcester, Bucks, Surrey, Berks ; in the two counties of Carnarvon and Glamorgan in Wales, and also in Scotland ; but there is no Irish record.

215. **Salda elegantula** Fall. (Acanthia id. Osh. Cat. subg. Chartoscirta).

Fall. Hem. Suec., 75, 7 (1829) ; Saund., H.H.B.I. 183 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken from March to September.

Habitat, etc. This species is found at the roots of plants in exceedingly marshy spots ; J. Sahlberg gives *Sphagnum*. It is much like *S. cocksi*, but can usually be easily distinguished at first sight by the yellow terminal joint of the antennae, which stands out very conspicuously in contrast to its black predecessors. Sometimes, however, this terminal joint is more or less obscured with black, but even then there is usually enough yellow left to catch the eye, and when this is not the case, the thinner antennae will distinguish it from *S. cocksi*, and the shape of the body from *S. cincta*. A closer examination at once reveals the long bristly hairs of its vestiture. Saunders describes the fourth antennal joint as black, or black with a yellow spot ; my own specimens could hardly be so described, and I was particularly struck with the yellowness of the terminal joint when first I found the species ; this is unquestionably more distinct in life than after death. According to

Puton this form with the terminal joint yellow is the *S. flori* of Dohrn. A specimen I have seen from Durham, collected by Dr. J. W. Harrison, has the terminal joint entirely black, and this also is the case with some from Gower in Glamorganshire, collected by Mr. Tomlin. The macropterous form is very rare.

Distribution. Though distributed throughout Northern and Central Europe and in Italy, the Crimea and Siberia, this species is rare in Britain. It is recorded from four English counties only, Durham, Cambs, Middlesex, and Dorset. It occurs also in Scotland, and in Glamorgan in Wales, but there are no Irish records. The Dorset specimens belong to the var. *flori.*

Family XII. **CIMICIDAE.**

Of this family, Oshanin catalogues a little over a hundred Palaearctic species, and of that number our British Fauna contains one-third—thirty-six species. They are mostly small insects, soberly coloured and of insignificant appearance, usually with very flat bodies. But they include the species which has had more direct influence on the welfare of human kind than any other in the whole order, viz. the Bed-bug, together with a few other species, which, to judge from their vast numbers and their ubiquitous distribution, must play a very important part in the economy of Nature. Their diet is probably, to a large extent, of an animal nature, and some are to be regarded distinctly as parasites. Some few species exhibit the peculiar phenomenon of sexual dimorphism, with the ♀♀ also more common than the ♂♂, a disparity which suggests the possibility of parthenogenesis on a rather large scale. In some cases the organs of flight are quite rudimentary, such condition being the normal, if not indeed the only one; in other cases the insects are dimorphic, with the brachypterous form the commoner of the two. Others, again, have established myrmecophilous relations and are habitually associated with ants. Structurally, they present the characteristic of a more complex elytral conformation than is to be found elsewhere in the order, the hemielytra being composed of five areas, more or less distinctly separated from one another by sutures. This and the narrowly produced and horizontally extended face make their recognition as a family an easy matter, though the discrimination of the species is often difficult. They are divided into four well-marked sub-families, distinguished by the structure of the rostrum, antennae and tarsi, and the presence or absence of ocelli.

Sub-Family I. **Ceratocombina** (Dipsocoridae).

This sub-family are distinguished by their three-jointed rostrum and tarsi, their very thin antennae and the presence of ocelli. They are minute and very delicate insects, often having much the appearance and method of movement of small Diptera. Very few species are known; Reuter's

Monograph, published in 1882, contains only twenty species for the whole world. Oshanin's Catalogue gives ten Palaearctic species, of which three have been discovered in Britain ; these are all dimorphic, but in a rather peculiar way, seeing that even in the brachypterous form the hemielytra are longer than the body.

216. **Ceratocombus coleoptratus** Zett.

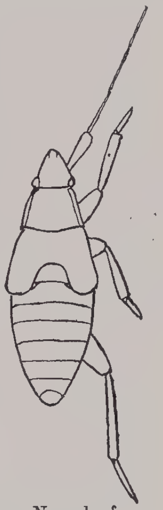
Zett. Act. Holm., 174, 24 (1819) ; D. & S., B.H. 514 (1865) (muscorum) ; Saund., H.H.B.I. 189 (1892).

Ova. Unknown.

Larvae. Last instar, 1¼ mm. Elongate oval, reddish testaceous, with wing-pads pellucid and fumose ; legs and antennae testaceous-fumose ; head large, triangular ; pronotum transverse, trapezoidal, sides slightly rounded in front ; wing-pads not extending beyond second abdominal segment ; each abdominal segment with a long and stout seta on each lateral margin ; last two abdominal segments testaceous-fumose ; rostrum stout at base, three-jointed, nearly reaching intermediate coxae ; tarsi two-jointed, with basal joint very small ; antennae as in adult.

Life-cycle. I have found the imago always in August and September ; Donisthorpe has taken it also in March and June. The larvae sometimes occur with the adults in August.

Habitat, etc. This insect inhabits moss, and I have never found it in the open. Morley, however, records taking one on *Mentha* in a damp meadow. Bedwell took a specimen on the body of the beetle *Melanophila acuminata* De G. I have usually taken it in moss which grows under *Calluna*, or at the roots of grasses where these are overgrown with moss. If this be shaken over paper, the insects fall out and look much like flies of the genus *Phora*. It occurs, however, under dead leaves as well, especially in damp places, and has been found under bark in similar spots ; Norman records it from under stones. According to Reuter, it is found also in the nests of *Formica rufa*, *F. sanguinea*, and *Acanthomyops fuliginosus*, and Dalla Torre adds *A. niger* in June. The only British records from ants' nests are by Mr. Donisthorpe, who took a specimen in a nest of *F. exsecta* at Bournemouth on September 8th, 1906, and another was bred out of a nest of *F. fusca* which was taken on March 7th, 1908, at Porlock.



Nymph of *Ceratocombus coleoptratus* Zett.

The insect is dimorphous, but the brachypterous form is the one almost always found. I possess one macropterous specimen taken on the hills near Ewhurst, Surrey, in August, 1896, and the Power Collection contains another, taken at Esher. In this form the pronotum is much broader behind, and the membrane fully developed, although only its inner part is membrane-like, sub-hyaline and beautifully iridescent. The scutellum of the metathorax also is very largely developed, projecting far beyond that of the mesothorax, whereas in the brachypterous form it only just appears beyond the latter. In both forms the dorsum of the abdomen is of a bright red colour, brightest at the base. In ordinary circumstances, of course, this is not seen. In the macropterous form the wings are large and bilobate; in the brachypterous they are reduced to very small dimensions, though the bilobate character can still be traced.

A second Palaearctic species has been described from Scandinavia, in which country the insects of this sub-family seem to be much commoner than with us. It is subcortical in habits, and is placed by Reuter in a different sub-genus. Other species have been met with in Africa and S. America.

Reuter's description of the macropterous form of *C. coleoptratus* is as follows: "Pronoto convexo, trapezoidali, margine postico quam antico paullo plus quam $\frac{1}{3}$ latiore; hemelytris abdomen tertia parte longitudinis superantibus apice rotundatis, margine laterali dilatato; clavo distinctissimo; corio venis longitudinalibus, percurrentibus, areolas sex formantibus; basi areolis tribus, quarum una ad apicem clavi minuta, triangulari, duabusque exterioribus elongatis; deinde areolis duabus, exteriori subrhombea; ultima in ipso apice subtrapeziformi; membrana magna pellucida, iridescenti, alis metallice nitentibus, hemelytrorum longitudine."

It is not possible to say anything very definite as to the food of this insect. The free rostrum certainly suggests an animal diet, and if this is so, the food could only consist of such minute creatures as *Poduridae* and small *Arachnida*, or perhaps of eggs of insects.

Distribution. This minute insect is widely distributed, inhabiting both Europe and Siberia, and it extends northwards in Finland to Lat. 62° 20′.

In England, its records are rather scattered, Yorks, Lancs, Derby, Norfolk, Suffolk, Kent, Surrey, Sussex, Berks, Hants, and Cornwall. I have taken it at Pendine in Carmarthenshire, and it has also occurred in Scotland, where Norman found it at Forres, but there are no Irish records.

217. **Pachycoleus rufescens** J. Sahlb.

J. Sahlb. Not. F.F. Fenn. Förh., 14, 305 (1875); E.M.M., xliv, 8.

Appended is a description of the insect, taken by Champion (8) from Sahlberg's diagnosis: Obovate, reddish-brown, opaque, thinly pubescent; abdomen fuscous, antennae and legs flavous; head large, triangular, somewhat convex; pronotum distinctly broader than long, transversely convex; hemielytra subcoriaceous, a little shorter than the abdomen, narrowly rounded at the apex; legs sparsely, shortly setose; anterior tibiae dilated at the apex; tarsi short. Long. $\frac{1}{2}$ mm.

Ova and **Larvae.** Unknown.

Life-cycle. Hitherto the imago has been taken in this country only in February, March, and June ; I have also a continental record for July.

Habitat, etc. This insect was first detected as British by Mr. G. C. Champion, who found a specimen amongst some Hemiptera collected by the late Mr. Philip de la Garde in Devonshire. This specimen was shaken from moss in a swampy wood near Dawlish in March, 1907. Mr. Champion (8) writes thus of the insect : "The genus *Pachycoleus* is closely related to *Ceratocombus* and *Cryptostemma*, the only other European genera of the family, but it may be known from both of them by the narrow, subquadrate, non-trapezoidal pronotum, the shorter rostrum, and the comparatively short second joint of the antennae. *P. rufescens* is not unlike *Cryptostemma alienum* H.S., the upper surface being opaque and the head very little longer than in that species ; but it is reddish-brown in colour, much smaller (the size nearly agreeing with that of *C. pusillimum* Sahlb.), less elongate, and not so depressed, and, as already stated, the pronotum is differently shaped. I have seen *C. alienum* in abundance amongst the shingle on the banks of the river at Watersmeet near Lynmouth, and also sparingly at Christow, and it is probable that the *Pachycoleus* may be found in similar situations." Keys (5) adds further particulars a little later : "Five or six specimens were shaken out of moss from a streamlet in the woods (at Loddiswell, S. Devon), but of these I regret to say I brought home but a single example. The fact was that I examined and discarded the first individual I put into a tube, as it seemed immature. I have wondered since whether the strong transverse nervure on the hemielytra may have deceived me in this respect. . . . Although so small, *P. rufescens* is readily discernible on the collecting sheet by its fleshy colour, as well as by its *Salda*-like power of leaping ; the latter propensity and its fragile structure, however, render it rather difficult to capture." Later on Mr. De la Garde too found the insect again at Christow, and kindly sent me a specimen ; this was taken in February, 1908. So the matter rested till June, 1914, when Mr. Champion (10) was fortunate enough to find the insect in the New Forest. He says : "While examining some wet moss by the side of a little stream in Dr. Sharp's company, on June 24th, we noticed amongst the common *Hebrus ruficeps* Thoms., various much smaller, narrower, wholly red individuals, which at first sight appeared to be larvae of that species. These latter, however, when examined under a lens, proved to be fully winged and undoubtedly *Pachycoleus*. Most of the examples captured by Dr. Sharp and myself were placed in a small tube for safety, and, as not rarely happens in such cases, the tube was subsequently lost. Two specimens, however, placed in a separate bottle, were secured. These are considerably smaller than all the others I have seen from S. Devon, but they appear to belong to the same species."

R. Sahlberg found a few specimens under *Hypnum splendens* near a stream in a pine wood in Finland. The insect seems to be much commoner in Scandinavia, from which district I have many specimens.

So far as at present known it is always brachypterous. Reuter suggests that *P. waltli* Fieb. may perhaps be its macropterous form.

Distribution. It has been found in Scandinavia, Finland, Germany, and Italy, and in our own country in Devon and Hants only, as shown above.

218. **Cryptostemma alienum** H.S. (Dipsocoris id. Osh. Cat.).

H.S. Panz., F.G. 135, 11 ; D. & S., B.H. 515 (1865) ; Saund., H.H.B.I. 190 (1892).

Ova. Unknown.

Larvae. A larva, measuring about 1 mm., which I took on the banks of the River Gwili in Carmarthenshire, is entirely shining testaceous, with long scattered golden hairs. It is probably in second or third instar. Head large, in the form of an isosceles triangle, with large projecting eyes ; pronotum rectangular and transverse, not reaching so far as the eyes ; the rest of the thorax is very large, about one-third of the length of the whole body exclusive of the head ; there are slight indications of wing-pads behind ; abdomen broader than thorax, with rounded sides ; legs stout, especially tibiae ; basal joint of antennae stout, somewhat clavate.

Life-cycle. The imago may be found from March to October. I found larvae of several ages on March 29th, together with the mature insect. The presence of the larvae, and the excellent condition of the imagines suggested that the latter had but recently made their final change. But according to Buchanan White, larvae of different ages may also be found with the imagines at any time within the above limits at least. These records seem to imply the continuous succession of broods, without any definite limits as regards time. They are interesting also in view of the early date of maturation, which is unusual amongst Heteroptera.

Habitat, etc. This insect is to be found on the sides of streams, running about in the open amongst the shingle or boulders. They are difficult to see, as they are much the colour of the stones. If there are boulders, they will rest on the top, and then when disturbed, dart down between the stones. They are not much inclined to use their wings, at least, such was the case on the fine bright day in March when I was watching them ; Halliday, however, gives a different account for summer time, as below.

Dr. F. B. White (6) has the following passage on this species : " This curious little bug is usually considered to be rare in Britain, but in Scotland, at least, I am convinced that it is universally distributed, and may be found in appropriate localities throughout the country by any one conversant with its habits. The celebrated Halliday, who constituted the genus (*Dipsocoris*), thus writes of *Dipsocoris* (" Nat. Hist. Rev.," ii, p. 61) : ' Inhabits the banks of rivers throughout the summer, gliding among the wet gravel, its silky down protecting it from the wet. It takes flight readily, even off the surface of the water. The yellowish larvae and pupae are found in the same situations, leaping like the perfect insect. In its habits it most resembles the *Saldae*, but shuns the light more than they do.' The favourite haunts of *Dipsocoris* are the large banks of shingle that are to be met with here and there beside most of our Scottish rivers. In such places, on turning over stones near the edge of the water, one is almost certain to see the little creature gliding swiftly along among the damp gravel, and hiding itself in some crevice. As far as I have seen, it does not appear to like too much wet, and I have never noticed it, as Halliday seems to have done, on the water, nor flying. When alive, the wing-cases are purplish-brown with a whitish bloom-like gloss produced by the fine adpressed hairs with which they are covered. The larvae and pupae may be frequently seen along with the perfect insect, but are not quite so active. They are brownish-yellow in colour and not unlike some species of mites often seen in damp situations among decaying vegetable matter. Larvae, pupae, and imagos may be found at any time from April to September, and I think probably during the rest of the year. What the insect does when the rivers are "in spate," and the banks of shingle are under water, I do not know. The highest altitude at which I have seen the *Dipsocoris* is 1100 feet."

According to Reuter the insect is dimorphous, the macropterous form differing from the brachypterous in the greater width of the pronotum behind, and the fuller development of the membrane. The wing is slightly bilobed.

Distribution. Reuter gives only the mountainous parts of Central Europe; one is surprised to note the absence of Scandinavia, where the allied species *C. pusillimum* J. Sahlb. is certainly common. *C. alienum* occurs also in Italy and the Crimea (Osh. Cat.). In Britain it has been recorded from seven English counties only, Northumberland, Cumberland, Yorks, Salop, Worcester, Hants, and Devon; from three Welsh counties, Carnarvon, Glamorgan, and Carmarthen; and from both Scotland and Ireland (Co. Kerry), in the former of which, according to Buchanan White, it is probably generally distributed. Probably the conditions are unsuitable in all but the more mountainous parts of the British Isles. There seems no reason why *C. pusillimum* should not also occur with us; it is much smaller than *C. alienum*, and might therefore easily be overlooked.

Sub-family II. **Cimicina.**

This sub-family contains the notorious bed-bug and its allies. All its members are parasitic, subsisting upon the blood of their hosts, which consist of warm-blooded animals, both mammals and birds, and not necessarily human beings. They are a very distinct group, easily known by the broad, oval, and very flat body, three-jointed rostrum and tarsi, in the *Ceratocombina*, the absence of wings and very rudimentary condition of hemielytra, and the absence of ocelli. There is also a very peculiar configuration of the pronotum, quite different from anything that obtains elsewhere in the family, or indeed one might almost say in the whole range of the British Heteroptera, and the rostrum is received in a groove instead of being free, as it is in the rest of the sub-families. Several species have been described, and the group is world-wide in its distribution. The species are very closely allied; all are of a ferruginous colour, and the differences are to be found mainly in such points as the nature of the pubescence, the width and exact shape of the pronotum, the proportion in the lengths of the antennal joints, etc. Those that are human parasites are most probably agents in the spread of diseases, and their powers in this direction have for some time past been under investigation, though the results thus far obtained have not been very decisive.

There has been much discussion as to the proper generic name of the bed-bug and its nearest allies, and general agreement has not yet been reached. The details of this controversy, however, lie beyond the scope of this book.

Five species of this sub-family have been described as British, and Oshanin gives six as European. But it must be remembered that the species are very much alike and that some of them, in fact most of them, favour more than one host, so that great care is necessary in discriminating species, and the host alone is not sufficient to settle the matter. More species are associated with bats than with any other hosts, and hence it has been suggested that when the bugs began first to turn their attention to human kind, it was from the mammalian order Chiroptera that they came. The bed-bug is even at the present day sometimes found in bats' nests.

219. **Cimex lectularius** Lin.

Lin., F.S. 909 (1761); D. & S., B.H. 510 (1865); Saund., H.H.B.I. 186 (1892).

Ova. The eggs are white, cylindrical, slightly curved, with a raised rim at the end of emergence, and rounded at the other end. The raised rim contains the micropyles. The eggs are about 1 mm. long, and the entire surface is covered with a minute puncturation which can only be seen under considerable magnification. The disclosure of the young bug takes place by the pushing out of a kind of lid. Leuckart supplies the following particulars as to the minuter structure of the egg. The chorion is strong; the upper surface of the lid has an irregular appearance, and is covered with a delicate network, the threads of which are most highly developed towards the middle, and enclose rather regular areas. The number of micropyles amounts to about one hundred; they appear as extremely minute canals which traverse the whole height of the raised rim, and open into the egg below; their walls form a projecting tracery on the inner surface of the raised rim.

According to Southall (" A Treatise of Buggs," 1730), who was not an entomologist, but an enterprising exterminator of these parasites, the eggs are laid in batches of about fifty each. Some experiments made in 1905 by A. A. Girault, at Paris in the State of Texas, gave the following results. A full-fed ♀ kept in confinement laid 111 eggs between June 18th and August 19th, during which period of sixty-three days it received at intervals eight meals ; the greatest number of eggs laid on any one day was eleven, which were deposited on July 28th. The mother died on September 6th, having laid no eggs during the last eighteen days of her life. Another specimen, equally well-fed at first, but kept in confinement without food, laid only seven eggs between June 18th and 27th ; it died on July 12th. Thus, as might have been anticipated, the supply of food has great effect upon the rate of oviposition, though, as only two insects were experimented upon, no general conclusions can be drawn as to fecundity.

Larvae. The following descriptions of larvae and details of life-history are taken from a paper published by A. A. Girault in " Psyche," 1905.

1st instar. Length, 1.45 mm. Whole body pale, sordid yellowish-white, much paler at exclusion ; eyes bright red ; a dark, transverse, sub-arcuate dash on dorsum of caudal abdomen, sometimes confused ; head and portions of thorax darker, subfuscous. Deep red after feeding. Antennae four-jointed.

2nd instar. Length, 2.10 mm., variable. The same ; sordid yellow, discus of abdomen dark from food ; eyes darker ; abdomen flat, depressed, wider than in 1.

3rd instar. Length, 2.50, variable. The same ; uniformly luteous, the discus of abdomen darker from food, its margins lighter ; eyes dark, abdomen oval (dorsal aspect), depressed, much wider. Exuvium sordid white.

4th instar. Length, 3.00 mm., variable. The same ; body slightly darker.

5th instar. Length, 3.80 mm., variable. The same ; body entirely fuscous.

To these may be added the following points, derived from specimens I have received from an old house in the slums of London. The rounded anterior expansions so characteristic of the pronotum appear to a slight extent in the first instar, and are fully pronounced from the second instar onwards. The mesonotum undergoes but slight alteration of form, there being scarcely anything that can be dignified by the name of wing-pads, until the last instar is reached, when there is a slight sinuation in the middle of the posterior margin. The metanotum does not alter in shape, and this, of course, corresponds with the fact that no wings are developed. In all the instars the body is pilose, the hairs being somewhat remote and almost stout enough to be called bristles. In the first instar they are longer and finer. The tarsi are throughout two-jointed, with the basal joint very small.

The operation of ecdysis is effected in the usual way, viz. by the splitting of the skin along the median line of the thoracic segments, and the whole animal gradually extricates itself at this aperture, carefully removing not merely the more robust parts of the body from their covering, but neatly withdrawing also the more slender parts, such as the legs and antennae, each separately from its sheath. During the moult, the claws are useful in obtaining a foothold on the irregularities of the wood, paper, etc., on which the change takes place ; by this means the shells of the limbs are prevented from becoming crushed or collapsed, and are enabled to retain their proper forms ; hence, but for the distortion caused by the thoracic fracture, and the paler tint, the cast skin might easily be mistaken for the insect itself.

Life-cycle. The fully-fed ♀ above referred to, which laid 111 eggs in confinement at Paris, Texas, was taken from an old wooden bedstead. It had already laid some eggs before capture. Five of the eggs which were deposited on the evening of June 22nd, showed no external change till the morning of June 24th, when they were shaded by the yolk-mass. At 8 a.m., 25th June, the embryo was plainly visible, showing buds of the appendages, the body segments, and the reddish eyes. On the morning of 28th June, they hatched without further changes. Two observations, made on a total number of thirty eggs during the last two weeks in June, averaged five days twelve hours. The eggs were kept indoors. This was at midsummer in lat. 33° 45° N., or in other words, within 10° of the tropics in the hottest part of the year. Temperature has probably a great effect upon the duration of the egg state ; and thus we find that Southall gives, as the result of many experiments made in the eighteenth century in London, i.e. some 18° farther north, an average of about three weeks for the egg state.

A single meal suffices, apparently, for all instars after the first, though occasionally a second is taken. In one individual which was fed regularly on a constant host, the five instars lasted respectively for 13, 8, 11, 5, 8 days, giving a total larval life of 45 days. In another, fed less regularly, but still under fair conditions, the instars lasted respectively for 14, 3, 6, 5, 6 days, a total of 34 days. This evidently shows that the total duration of larval life varies somewhat with the constitution of the individual. A third specimen took 78 days, because during the last two instars it seemed averse from food. A fourth specimen, placed under very adverse conditions, took 156 days to complete its metamorphosis. These particulars all apply to experiments made at Paris, Texas. Others made at Washington, about 6° farther north, gave 49 days. Southall, again, reports for those bred in London a total of about 11 weeks. It would seem, therefore, that there are at least three factors which determine the exact duration of larval existence, individual constitution, temperature, and supply of food.

As regards the duration of life after maturity has been reached, there is but little evidence. The first of the four specimens mentioned above lived as an imago for fifty-nine days, dying on October 8th, although it was kept supplied with food. The second lived forty-one days after becoming an imago, and died on September 13th without having taken any food. On the other hand the persistence of these insects, even in unoccupied houses, seems to imply that they can exist for very long periods of abstinence, especially if kept at a low temperature. And Girault gives one such instance in which the insect lived from August, 1902 to May, 1903 (259 days), remaining torpid during the greater part of the time. It is not yet possible, therefore, to draw any definite conclusions as to the natural duration of the life of this insect.

As the result of his observations, Southall concluded that oviposition might take place four times in the course of a year, in the months of March, May, July, and September, and that about 80 per cent of the eggs laid are fertile. He also formed the opinion that any eggs laid during the winter months were infertile. Girault concluded from his experiments that the insect normally lives only a single season.

A curious point in Girault's observations is the extreme length of the first instar and the quantity of food required in consequence. This is a great contrast to my experience with the larva of a *Capsid*, as detailed under *Miris laevigatus* (q.v.).

Habitat, etc. This insect, popularly known as the bed-bug is, so far as we know at present, found only in association with human habitations, and does not exist in a really wild state. Its occurrence in bedsteads is no doubt conditioned by the fact that in such places it can rely on the visits of its human hosts, upon whom, when they are in a state of unconsciousness, it can carry out its depredations without molestation.

It is believed not to be indigenous to this country, but according to Burmeister to have been introduced from the East in shipping. Others, however, have supposed that its true home is America, and that it was introduced thence on the discovery of the New World. It has certainly been long associated with human kind, and Pliny, writing in the first century, A.D., gives an account of it. But it was evidently an inhabitant of Europe even prior to the Christian era; for it is mentioned by both Aristotle and Dioscorides. Naturally, in England at any rate, it would appear first in seaports, and as it has no rapid means of locomotion, its spread to inland districts would apparently be slow. The earliest record of its occurrence in Britain is to be found in Mouffet's Latin treatise on "Insects, or Minute Animals," published in 1634. This writer, who does not state whence he obtained his information, says that in the year 1503 two ladies of noble family residing at Mortlake became greatly alarmed at finding themselves one morning bug-bitten, not knowing the cause of the inflamed swellings which had appeared upon their persons, and thinking they had contracted some frightful contagious disease. That even at this early date the insects were not entirely unknown, though certainly strange, appears from the ease with which the disquietude of the noble sufferers was allayed by their physician, who was at once able to point out to them the real cause of their disfigurement. Fallén, in his " Monographia Cimicum Sueciae," published in 1818, says that in his day there were countries in the North of Europe in which it was still unknown, and Curtis some seventeen years later speaks of them as even then only gradually spreading over England.

The inelegant monosyllable we are now accustomed to use as the name of this horrid parasite does not seem to have been applied to it at first; even Mouffet, who speaks of it in Latin as *Cimex*, gives as the English equivalent of this " wall-louse," but does not mention the word " bug " at all. This, however, is only negative evidence; and as there appears to be an undoubted reference to the insect under the shorter name in a play of Massinger's, dated twelve years earlier than Mouffet's treatise, it must have been at least in occasional use at that period. " Chinch " is another old name for it, which appears to have become extinct only a generation or two ago. Curtis calls it the " House-bug." The origin of the modern name is somewhat obscure. As applied to the insect, the word " bug " has been supposed to be identical with the old British word of the same form, meaning a hobgoblin or nocturnal apparition, a word still existing in the compound " bugbear "; and the idea was that the name was transferred to the insect in consequence of its nocturnal and disgusting habits and the alarm they occasioned when, as in the instance above referred to, the cause was unknown. But Sir James Murray points out in the " New English Dictionary " that this is mere conjecture, and no direct evidence of the transference of the name is forthcoming; hence it is safer to regard the etymology of the word, as applied to this and other insects, such as the May-bug, etc., as at present unknown. In Shakespeare the word occurs several times, in the sense of a spectre, but never as the name of the parasite, which, indeed, does not appear to be mentioned by that observant author, a tolerably good indication that it was not very common in his time. Southall, indeed, maintained that when he wrote bugs had been established in England only for about sixty years, which would throw their first appearance down to the year 1670; but this idea is plainly refuted by the notes of time already mentioned. He says that in his day they were to be found in all seaports, but had not yet penetrated to inland towns.

The nymphs, says Girault, are very voracious and at a single meal gorge themselves until unable to hold more. The time, therefore, given to each meal is limited by the capacity or size of the larva at the time of any one meal, the capacity of course depending upon, or rather being, more or less bounded by the different instars. For a meal in the first instar it requires, on the average, about three minutes to glut itself, in the second five, in the third six, in the fourth eight, in the fifth ten, and when adult from ten to fifteen.

Girault himself assumed the rôle of host to the insects upon which he was experimenting, feeding them from the fore-arm, the hands, and the tips of the fingers. When punctures were made on the upper portion of the fore-arm near the wrist neither pain nor swelling resulted. But in the case of the adult and the larva in its fifth instar, a distinct itching was felt, somewhat like prickly heat, but the other symptoms of inflammation did not appear. This, however, is not the case with all human beings, as many know to their cost. With some there is intolerable itching, and inflamed swellings appear. There seems little doubt that human blood is not an absolute necessity of life to this insect. Southall declares that he fed the numerous families he kept not only on blood but on dried paste, size, deal, beech, osier, and some other woods, the sap of which they sucked, and that on any one of these they would live all through the year. On the other hand, such hard woods as oak, walnut, cedar, and mahogany they would not feed upon, all that were confined to these having starved to death. Girault found also that they would live on the bodies of mice, both living and dead.

Bugs are enterprising insects, and do not necessarily confine themselves to bed-chambers nor to the room in which they have been bred. Girault gives many instances of painful experiences in a small town in Virginia, where the insects were not only abundant inside the houses but also swarmed over to the outside and attached themselves to visitors as they entered. W. F. Fiske, when working at night in a laboratory at Tryon, North Carolina, found that the insects would crawl along the under sides of the edges of the table and stealthily approaching his bared arms would attempt to feed. Similar experiences were met with elsewhere even in December and January. Thus, although in our own country they are nocturnal in habits and not, like fleas, personal parasites, they do not confine themselves elsewhere to walls and furniture, waiting for opportunities of attack on their hosts, but also become personal parasites, appearing in the day-time amongst the clothing and on the flesh.

As already mentioned, they are able to endure long abstinence in both larval and adult conditions, though exact records on the subject are few in number. De Geer, during the winter of 1772, enclosed a number of specimens in a sand-box (apparently such as was used in those times for sprinkling writing with sand in order to dry it), but whether it still contained sand or not he does not say. The box was placed in a closet exposed to the north, and in a room in which there was no fire. The winter happened to be particularly severe, with a minimum temperature of 33° below freezing point. The insects remained torpid during the winter, but by the following May they were quite lively, only a few having died, and the survivors consisted of both young and adult specimens, and these had evidently fasted during the time of their incarceration. Curtis was of opinion that the adult ♂♂ took no food.

According to Southall, the insects, when confined together, are pugnacious; he says, "I have often seen some (that I brought up from a day old, always inur'd to Light and Company) fight as eagerly as Dogs or Cocks, and sometimes one or both have died on the Spot." Curtis has a curious idea that the insect sometimes carries its rostrum reversed over its head, in which position of course it could feed only on some object above it.

Bold speaks of this species as abounding in coal mines in Northumberland, hiding in the cracks and crevices of the woodwork used in the construction of the galleries. The high temperature of the mines is probably favourable to the insects, but it is difficult to see what they find to feed upon, unless indeed they make excursions to attack the bodies of the miners. According to Reuter (19), it is sometimes found in bats' nests. Dr. Nickerl once found a specimen on the trunk of an old oak tree which was about 2½ miles from the nearest human habitation.

The interesting question suggests itself whether this pest, always apterous as we know it, except for the two insignificant scales at the base of its abdomen, ever acquires fully developed wings, and with them the power of flight, thus justifiably adding to the repugnance with which it is usually regarded. Burmeister lends countenance to the possibility of this, at least in India.

According to a Spanish traveller named Azzara, this insect does not attack human beings when they are in a savage state, but only when they have reached such a degree of civilisation as to be collected into towns and to inhabit houses. It is not always the same species that attacks human beings, however; e.g. a large number of specimens which I received from India, and which had been taken from the bodies of out-patients at a hospital, belonged to the species *C. rotundatus* Sign., and there was not a single *C. lectularius* amongst them, and Horváth has described a species *C. dissimilis*, which was found on the wall of a house in Central Hungary, though elsewhere occurring in bats' nests.

Many remedies have been suggested against this pest, but none appear to be very successful, and in some cases the remedy seems to be worse than the disease. De Geer mentions one suggested by Tiburtius, viz. hanging up bunches of the plant *Thlaspi arvense* L. in the infested room, but his own experiments did not give him any confidence in this. Several other plants have been used as cimicifuges, their smoke, when burnt, being believed to be obnoxious to the insects. Cow-dung and horse-hair were used in a similar way. Superstition and credulity went so far as to place confidence in the occult influences of such objects as stags' horns, rabbits' feet, foxes' ears, etc., when hung up near beds. Fumigation with sulphur or terebinthene, again, has been advocated, and Curtis says that, in travelling abroad, he often protected himself by sprinkling turpentine on the sheets. Insect powders of the usual type are not of easy application in the case of an insect which penetrates into small cracks and crevices, behind wainscoting or loose wall-papers, or into the joints of bedsteads ; and hence one or other of two methods have chiefly to be relied upon—either the application of a mobile and penetrating liquid or the production of a noxious vapour. Liquids of the benzine and petroleum type are the best to use under the former head. Dr. Packard recommends an exceedingly simple preparation, consisting of "thirty parts of unpurified cheap petroleum mixed with one thousand parts of water." Frank Buckland recommended benzine, which he squirted into their hiding-places by means of a small glass syringe, with the effect that they turned out at once, and could be despatched by further applications of the same fluid. Methylated spirit and diluted carbolic acid are other liquids that may be employed with more or less success, whilst boiling water is, of course, certain death to any that it may reach, in whatever stage of life they may be. But there is no doubt that the habits of greater cleanliness which distinguish the present generation from their ancestors, and the frequent recurrence of "spring cleaning," have had much to do with lessening the numbers of this pest. The introduction of the plain iron bedstead, too, which replaced the great wooden heavily draped four-posters of previous generations must have put a serious check upon the multiplication of bugs.

John Southall made bug-hunting his speciality, and of course had a specific of his own, the composition of which he kept a profound secret, relating that he had obtained the knowledge of it from an old grey-haired negro whom he met in Jamaica. On the title-page of his "Treatise on Buggs," he describes himself as the "Maker of the Nonpareil Liquor for destroying Buggs and Nits, living at the Green Posts in the Green Walk near Faulcon Stairs, Southwark." He seems to have found abundant employment for a considerable staff of employees, who worked under his personal supervision ; and his clients were to be reckoned amongst the most well-to-do classes. His charges were half a guinea for ridding the most elaborate bedsteads, and proportionately smaller sums for those of an inferior style, an ordinary four-poster with plain furniture being undertaken for six shillings.

Bugs have a few natural insect enemies, amongst which may be mentioned the Reduviid *Reduvius personatus*, the cockroach, *Periplaneta orientalis*, and certain species of ants.

Such an insect as *C. lectularius* could not fail to have medicinal virtues attributed to it at a time when the pharmacopoeia contained multitudes of nameless horrors. Pliny states that it was in his time regarded as an antidote to the bite of serpents, "especially of asps," adding that fowls which had eaten bugs would not be injured if bitten on the same day by an asp. Another Roman author says that an infusion of the bodies of seven crushed specimens was administered to patients who were sinking into an insensible condition, with the intention of rousing them from their lethargy !

According to Léon Dufour, the digestive tract of this insect is three or four times as long as the body. In 1898 Dr. A. Ribaga, an Italian naturalist, published an account of an asymmetrical structure occurring in the adult female, and apparently thus far overlooked, although it communicated with the exterior by a conspicuous notch in the fourth abdominal segment, midway between the median line and the lateral margin. This structure consists of a large quasi-glandular mass of unknown nature, in which is encapsuled an organ consisting of fibres, the free ends of which terminate in minute chitinous spines in a recess lying under the fourth abdominal segment. The adjacent margin of the fifth segment is thickened and set with strong teeth. The non-glandular part of this structure was conjectured by its discoverer to be a stridulating organ ; but no evidence of stridulation has been obtained. This organ was subsequently named by Signor Berlese the "organ of Ribaga." The latter entomologist also discovered in the same sex what he has called the "spermatophagous organ" ; it consists of a bursa associated with the spermatheca, and its cells apparently ingest and destroy the excess of spermatozoa.

Speaking of the world-wide distribution of this insect, Prof. Uhler says : "As might have been expected under such circumstances, it is subject to much variation in the relative size, proportions, and forms of most parts of the body. Full-favoured, gross specimens are often quite coarsely punctured and hairy, while their half-starved brethren have a much thinner outside integument and finer punctures, with less conspicuous pubescence. Some specimens have the wing-pads hanging loose as if ready to change into wing-covers, but generally these are run together into one piece in the middle line." He adds that thus far no individuals have been met with fully winged. In the light of what was said in the introduction to this sub-family, it seems open to question whether all Uhler's remarks refer to the same species.

According to Horváth ("Ann. Mus. Nat. Hung." VIII, 1910), a specimen of *C. lectularius* was taken from the body of a bat at Grahamstown, S. Africa, though it was recorded at the time as *C. pipistrelli* Jen. ("Journ. Hyg." VI, 1906, p. 246). *C. lectularius* has also been found in the United States, performing the rôle of *C. columbarius* as a parasite upon poultry and pigeons, and it is interesting to note that this change from a diet in which the blood corpuscles were circular and non-nucleated, to one in which they were oval and nucleated, does not seem to have incommoded the bugs at all. They are rather fond, too, of mice, living or dead, and especially of young mice.

Distribution. As this species has chosen to attach itself to the fortunes of the human race, it may be expected to occur wherever its hosts are sufficiently uncleanly and careless of personal regard to afford it a convenient lodging, and its universal distribution, therefore, is simply a question of time and the requisite conditions. But this is not the only species of *Cimex* that is parasitic upon man ; in India, e.g. *C. rotundatus* Sign. occurs quite commonly, and all that I have received from the bodies of Indian people have proved to be this species, without any admixture of *C. lectularius*. Possibly, in such a case, the one species might serve to prevent the incursion of the other.

As regards our own country, it is of course difficult to obtain reliable statistics, as no one is anxious to admit the presence of the pest in his own neighbourhood. Notwithstanding this, however, the insect has been recorded from twenty-nine English counties, including, naturally, all those on the coast (eighteen in number), and the following : Staffs, Derby, Notts, Leicester, Cambs, Warwick, Oxon, Middlesex, Surrey, Berks, and Wilts ; the only Welsh record is from Glamorgan (Hallett) ; it is also recorded from Scotland but not from Ireland.

220. **Cimex columbarius** Jen.

Jen., An. N.H. iii, 242, 244, 2, pl. 5, fig. 1 (1839) ; D. & S., B.H. 510 (1865) ; Saund., H.H.B.I. 187 (1892).

Ova and **Larvae.** Undescribed.

In the magazine " Psyche," December, 1905, there is given what purports to be an account of the habits and development of this species, but Horváth, who has seen the specimens referred to, pronounces them to be *C. lectularius*. They were taken in a large poultry and pigeon farm in America, and from the nature of the hosts were apparently assumed to be *C. columbarius*, a species which, however, does not occur in the New World.

Life-cycle. The adults have been found in April, June, and September ; but in this case again, there is probably a certain amount of irregularity, such as would naturally result from its semi-domesticated condition.

Habitat, etc. This species is found in pigeon-cots and fowl-houses. It was formerly, no doubt, much commoner than at present, seeing that nowadays so much more attention is paid to the cleanliness of such places.

Distribution. Little is known of the distribution of this insect ; it is recorded from France and Germany as well as Britain, but no doubt it occurs elsewhere, where poultry are kept. As regards our own country, the records are very scanty ; six counties only are given for this species, Yorks, Notts, Lincs, Norfolk, Devon, and Cornwall. There are no records for either Wales, Scotland, or Ireland.

221. **Cimex pipistrelli** Jen.

Jen., An. N.H. iii, 243, 244, pl. v, fig. 3 (1839); D. & S., B.H. 512 (1865); Saund. H.H.B.I. 188 (1892).

Ova and **Larvae.** Not described.

Life-cycle. No particulars are available.

Habitat, etc. This species is a parasite on bats. As to the species of Chiroptera which serve as hosts, Jenyns says *Nanugo pipistrellus*, to which Reuter adds *Panugo noctula*, and *Cateorus serotinus*, three well-known bats, the pipistrelle, or long-eared bat, the noctule, and the serotine. The pointed abdomen mentioned by Saunders is sexual, and characteristic of the ♂.

Distribution. On the Continent it is recorded from Holland, Germany, Switzerland, and Russia. But it is by no means certain that all these records refer to the same species. There are several species of *Cimex* parasitic on bats, including even *C. lectularius*, and the distinctive features of the different species have not always been rightly grasped. The only certain locality for this species is Cambs, from which Jenyns got his type.

221a. **Cimex dissimilis** Horv.

Horv. An. Mus. Nat. Hung. (1910).

Ova. Not described.

Larvae. An intermediate instar, probably the third, 2½ mm. Pale testaceous, very similar to that of *C. lectularius*, but differing as follows: the setae bordering the thoracic segments are longer and nearly straight, abruptly truncate at the apex, while those of *C. lectularius* are curved and slightly clavate; general pubescence of body longer; anterior margin of pronotum less excavate, so that the auricular prolongations of its anterior angles are less prominent, and its posterior angles also are rounded instead of angular; a central longitudinal white line through the thoracic segments, and hinder angles of first abdominal segment also whitish. In some cases the contents of the digestive organs show as a broad black patch extending to the anus.

An earlier instar, probably the second, 1¾ mm. Except for size, almost identical with preceding; colour a little paler, and posterior angles of pronotum still more rounded.

A later instar, probably the fourth, 3 mm. Identical with above, except that traces of wing-pads appear on the mesonotum. These were recorded when discovered by Mr. Britten, as *C. pipistrelli*, but they do not appear to be really that species.

Life-cycle. Britten obtained larvae and imagines in April and May, in a rotten elm at Thame Park, Oxon. They were in a woodpecker's old nesting hole, which apparently had been used as a roosting place by bats, although there were no other signs of occupation by these animals. It has also been taken in August.

Habitat, etc. As mentioned above, we have in this country more than one species parasitic upon bats and this is one of them. The various species of *Cimex* are much alike ; and specimens taken in the New Forest by the late Rev. H. S. Gorham have been referred to as *C. pipistrelli*, but they are certainly not *C. pipistrelli* nor *C. lectularius* ; they are much broader in the pronotum than the former and with longer hairs than the latter, and Dr. K. Jordan has referred them to *C. dissimilis* Horv.

Distribution. On the Continent it is recorded only from Hungary and Bohemia. In Britain it has occurred in Hants (Gorham) and Oxon (Britten), and possibly elsewhere. Gorham's captures were made in the New Forest.

222. **Cimex hirundinis** Jen. (Oeciacus id. Osh. Cat.).

Jen., An. N.H. iii, 243, 244, 3 pl. v, fig. 2 (1839) ; D. & S., B.H. 511 (1865) ; Saund., H.H.B.I. 187 (1892).

Ova. Not described.

Larvae. " The young, or pupae, have the abdomen much narrower than the perfect insect, inclining to oblong " (Jenyns, " Ann. Nat. Hist.," 1839, Vol. III, pp. 241–4).

Life-cycle. Both imagines and larvae in different instars have been found in both April and September, while larvae and nymphs only were found in July (Reuter, 19). Bacot took both sexes in October.

Habitat, etc. This species occurs in the nests of the house-martin. In Ireland it has been found on a dead swallow and Reuter (25) reports it from the nests as well. He mentions one nest which yielded two hundred specimens. Dubois also found it in the nests of the sand-martin and Reiber in those of the swift. Horváth reports it also from nests of the house-sparrow and Montandon apparently also from that of a small species of owl (Reuter, 25). In the United States it has been found in great numbers in the nests of the barn swallow. " The bugs appear to be confined to the swallows' nests, or upon the parts of the barn adjacent to them, some being observed on the sides of the barn nearly down to the ground. They were very abundant after the swallows had left in autumn, and specimens kept in a bottle corked with a rubber stopper were alive the following summer. It would be an easy matter for them to survive in the nests or in cracks and corners of the building near the nests during the winter absence of the hosts. The nests contained immense numbers of empty eggshells, showing that the eggs were deposited directly in the nests, and where the young bugs in hatching would at once gain access to the birds. While it is impossible to say at just what time the eggs were laid, it is safe to conjecture that they are laid some time during the early part of the summer, probably soon after the appearance of the swallows in the spring, and that the young become partially grown at least before fall. It is, of course, possible that they may use other food than the blood of the swallows, but it is evident that they are closely associated with this bird as a host" ("Bull. 5 n.s. U.S. Dep. Agric.," 1896, p. 161).

As further evidence that the bugs swarm over the nests and appear on adjacent parts of the buildings, Saunders mentions having taken a good series of this insect on the windows of a house in Chobham, Surrey, under the eaves of which were some martins' nests.

By most authors the martin bug is considered to be generically distinct from the rest of our British Cimicina, and is referred to the genus *Oeciacus*.

As the usual host of this insect is a bird of passage, which is absent from the country for at least six months out of the twelve, there must be, as hinted above, something exceptional about the economics of its life-cycle. In some cases, at any rate, the parasite is left behind on the departure of the bird. Bacot found specimens in a deserted martin's nest in the autumn, and these, when given the opportunity, fed upon human blood; they also, but less readily, sucked a pigeon, to which they were introduced. After some time they were induced to mate; eggs were laid, which hatched in due course, and the young accepted human blood as an appropriate diet in the absence of their proper host, and got through their first instar upon it.

Distribution. Of general distribution on the Continent, it is recorded in Britain only from the seven English counties of Norfolk, Cambs, Kent, Surrey, Hants, Devon, and Glo'ster, and from the North of Ireland; there are no records for either Wales or Scotland. As the bird host is so common and generally distributed, it may be suspected that the above-indicated tract of country represents rather the distribution of observant Hemipterists than the actual area inhabited by the *Cimex*, unless, indeed, it should be the case that only weaklings amongst the birds are attacked by the parasite. Certainly, so far as present experience goes, this must be considered a rare species with us, though where found it is usually abundant.

Sub-Family III. **Anthocorina.**

A rather extensive group of small and obscure insects, which are of a more oblong form than the *Cimicina*, and differ from that sub-family also by the presence of ocelli in the adult. Both hemielytra and wings are usually fully developed, but in some few cases there are brachypterous forms in both sexes. In his table of the sub-families of the *Cimicidae*, Saunders relies partly upon the long hairs which clothe the antennae of the *Ceratocombina* to distinguish them from the *Anthocorina*; but the last two joints in some of the latter are furnished with equally long hairs, and the character fails altogether when exotic species are taken into account, for the antennae of several of these carry throughout hairs which are quite as long as those of the *Ceratocombina*. For the Palaearctic Fauna, 80 species of *Anthocorina* are enumerated in Oshanin's Catalogue, but of these only 23 are known as British, and these are distributed amongst 12 genera. In Reuter's Monograph of the

Anthocoridae of the World, published in 1884, 142 species are recorded, but since that time many others have been described, and undoubtedly, large numbers still remain to be discovered ; but being small and obscure insects they are much neglected by collectors who are not specially interested in the group, and hence it is scarcely possible to come to any reliable conclusions as to the distribution of the sub-family as a whole.

Very little is known of their habits, but some species, at any rate, prey upon Aphides ; others are habitually associated with ants, and still others are subcortical. They are found chiefly upon plants and trees, and only in a few cases on the ground ; hence they are captured chiefly by beating and sweeping. Many species teem numerically, existing in their hundreds of thousands.

The larvae can usually be recognised by their flat, elongate oval shape, and the pointed head which is directed straight forward. There is great freedom of motion in the rostrum, which is often very long, and the very short basal joint of the two-jointed tarsi is a very constant character.

223. **Lyctocoris campestris** F.

Fab., E.S., iv, 75, 34 (1794) ; D. & S., B.H. 499 (1865) (domesticus) ; Saund., H.H.B.I. 191 (1892).

Ova. Undescribed.

Larvae. An intermediate instar, 2¼ mm., taken April 10th, 1914, at Letchworth, Herts. Ovate, reddish testaceous, with a clear testaceous margin to the whole of the body behind the head ; head convexly triangular, rather longer than broad at base ; pronotum trapezoidal, transverse, rather convex on disc and explanate at margins ; wing-pads quite small ; the whole surface finely punctate and pubescent, except down centre of dorsum, where it is finely transversely striate ; legs and antennae testaceous ; tarsi two-jointed, basal joint very short.

Later instar, 3 mm. Similar to the above, but with larger wing-pads. The whole body is more or less shiny.

Life-cycle. The imago is found practically all the year round ; I have records for all months except March and November. While the majority probably mature in August, there is apparently much irregularity in development ; larvae of various ages may be met with together, not only during the summer months but also earlier, and these too are accompanied by adults ; thus I have found many stages in April, some of which can hardly have been more than a few days old, while others were almost ready for their last moult. In fact the indications are that there are specimens which reach maturity at various times during the spring and early summer months, although no doubt the majority belong to the brood which matures in August.

Habitat, etc. This is one of the species that have to a considerable extent attached themselves to the fortunes of man. They are found most abundantly in the thatch of hay-, straw-, and bean-stacks, and also in the refuse of the stacks and in granaries ; I have found specimens also in a flour-mill and in a hay-loft. Probably any kind of vegetable rubbish will form a suitable nidus for them. Hall (3) found it on fences, and J. E. Mason (1) in pigeon-cots. Such localities are more or less man-provided. As regards what may be denominated natural localities it occurs, though not so abundantly, on hedge-banks amongst the rubbish that accumulates there, and on the sides of the Broads of East Anglia. Morley (4) reports it from *Boleti*, in which he suggests it might have been preying upon the larvae of *Orchesia micans ;* Parfitt found it feeding on the larva of a species of *Thrips* on flowers in July. Tuck found a larva in a nest of *Bombus agrorum ;* and J. E. Mason (1) mentions its occurrence on sandhills. Reuter (19) gives as the habitats, houses, stables, and cattle-stalls, swallows' nests, heaps of straw, gardens, under bark, on trunks of trees, on *Populus italica*, etc. But for the greatest number of specimens, and for the most flourishing condition, no place is better than the thatch of stacks. It is occasionally found in houses, and J. E. Mason (1) gives an instance of its being captured on an office table. The insect can inflict a sharp prick with its rostrum. Reuter maintains that it was originally a vegetable feeder, living in the open, but that being introduced into stables and cattle-stalls with straw it then abandoned its vegetarian habits and became a blood-sucker on both horses and cattle.

Distribution. Spread all over the Continent and in North Africa and Syria, it inhabits also the Oriental, Australian, Nearctic, and Neotropical provinces. It is probably also one of the commonest Heteroptera we possess in this country. It is included in almost all published lists ; I have records for thirty English counties, consisting of all except Westmorland, Derby, Staffs, Salop, Worcester, Rutland, Hunts, Beds, Northants, and Monmouth ; Welsh records are from Carnarvon, Glamorgan, and Carmarthen ; and it is found in both Scotland and Ireland. It has spread even to New Zealand (Buchanan White, 4), and Wollaston found it in St. Helena (Buchanan White, 6).

224. **Piezostethus galactinus** Fieb.

Fieb. Weit. Beitr., i, 107, 7 (1836) ; D. & S., B.H. 500 (1865) ; Saund., H.H.B.I. 193 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in August, September, and November ; Douglas and Scott (1) say also spring and summer ; there is a continental record for June.

Habitat, etc. This species is found chiefly in manure heaps and hot-beds and amongst stable straw. I have taken it also in a haystack. It occurs also in marshy places, such as the Broads of East Anglia and the Plumstead Marshes. In the Broads it is found in the marsh haystacks. (Morley, 4.) Reuter (13) quotes the following: Amongst decaying grass, on dung (Schiödte), with *Myrmica caespitum* (Bellevoye), on oak and beech, and under the bark of trees (Frey Gessner), and Fieber (2) gives "on plants in meadows."

Distribution. Distributed throughout the Continent, it extends also into Africa, Asia, and N. America (both Nearctic and Neotropical); it is recorded in Britain from the coast counties extending from Suffolk round to Glo'ster, and from Northumberland, Cumberland, Durham, Yorks, Lancs, Cheshire, Leicester, Warwick, Oxon, Bucks, Middlesex, Surrey, Berks; from Glamorgan in S. Wales, but from neither Scotland nor Ireland.

225. **Piezostethus cursitans** Fall.

Fall. Mon. Cim., 74, 24 (1807); D. & S., B.H. 501 (1865) (rufipennis); Saund., H.H.B.I. 193 (1892).

Ova. Undescribed.

Larvae. An early instar, possibly the second, 1 mm. Long oval, bright scarlet, with testaceous legs, antennae and rostrum. Head triangular, pronotum transverse, mesonotum transverse with slight indications of wing-pads, tarsi two-jointed, first joint very small; the contents of the intestine show through the skin as a darkish mass, which becomes a black spot in the rectum.

Next instar, $1\frac{3}{4}$ mm. Similar, but not quite so bright in colour, with legs and antennae slightly infuscated; a very narrow testaceous margin round the body behind the head; wing-pads slightly larger.

Next instar, $1\frac{3}{4}$–$2\frac{1}{4}$ mm. Similar, but less red, and with antennae and femora more infuscated. Pronotum longer, wing-pads well developed. This is probably the last larval instar.

In all the instars the surface is glabrous and shining.

Life-cycle. The imago has been found from January to October, except in May, and the larva in June. This probably indicates that the insects mature in July and live on through the winter till the following spring. Its subcortical habits would make this easily possible.

Habitat, etc. This species is essentially a subcortical insect. It is found under the bark of dead and decaying trees, such as oak, beech, and ash, and also in the rotten wood. Reuter (13) says it occurs principally under pine bark, but that is certainly not the case with us. Morley (4) records taking it in moss on a poplar. Parfitt found it under dead leaves in March. Fieber (2) says it is found on the inflorescence of *Hippuris vulgaris.* Bedwell found a specimen on the body of the living beetle *Melanophila acuminata* De G.

This species is usually brachypterous, but a few specimens generally occur in each batch with fully developed hemielytra. The gravid ♀ has a very different appearance and might be mistaken for a different species; the abdominal segments, instead of overlapping one another to the extent of nearly half their length, as is usually the case, are fully opened out, thus revealing the smooth and polished basal half of each segment, which is ordinarily concealed under the preceding one.

Distribution. It is of general distribution on the Continent, extending into Turkestan, Siberia, and Algeria, and in Britain is recorded from the coast counties extending from Yorks to Cornwall, except Lincs and Kent, and from Cumberland, Cheshire, Staffs, Derby, Notts, Warwick, Worcester, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; from Pembroke and Glamorgan in S. Wales, and from Ireland, but there is strangely enough no record from Scotland. In the Alps its area of distribution rises to a height of 7000 feet.

226. **Piezostethus formicetorum** Boh.

Boh. Vet. Ak. Hand., 158, 23 (1844); Saund., H.H.B.I. 194 (1892).

Ova. Unknown.

Larvae. Almost identical with those of the preceding species, but smaller and paler, and with pronotum rather shorter. The colour is testaceous, slightly tinged with red, especially about the head. The last larval instar has a length of from 1½ to 2 mm.

Life-cycle. The imago has been found in May and July, and the larvae in their last instar at the end of June (King).

Habitat, etc. This species is myrmecophilous, being an inquiline of *Formica rufa* (Donisthorpe, 2), and is said to dwell deep down in the nest (Buchanan White, 4).

Reuter (13) quotes also the following: In nests of *Formica sanguinea* and *truncicola* (Schiödte), with *Acanthomyops flavus* (Puton); and J. Sahlberg gives *F. exsecta*.

Distribution. It is recorded from Northern and Central Europe, and in Britain only from four localities in Scotland, Glen Lui, Braemar, Rannoch, and Nethy Bridge.

[*Piezostethus flavipes* Reut. " While on a visit to the town of Carmarthen last August I had the opportunity of looking over a corn-mill and warehouse, and amongst some of the usual granary Coleoptera I found a living brachypterous specimen of the above Hemipteron, a species not hitherto recorded from this country. I learn from the proprietors of the warehouse that they receive grain from abroad, and amongst other places, from the Black Sea ports. The insect is therefore probably an importation from those regions. This is not, however, its first occurrence in England, as I find that Mr. Edward Saunders had a specimen quite similar to mine, which is labelled 'in Persian wheat from Basra, found living in a warehouse in England.' Nothing more definite is known as to the locality of this specimen.

"*P. flavipes* is a small species $1\frac{1}{2}$ mm. in length, of a light pitchy colour, with recumbent pale pubescence ; hemielytra, together with antennae and legs, wholly flavous ; pronotum shining and narrowed in front, and abdomen widest behind the middle. In the brachypterous form the hemielytra reach the base of the third segment of the abdomen. Reuter (13) gives this species as the only representative of the subgenus *Arrostus*, which differs from *Piezostethus* proper, *inter alia*, in the absence of exserted setae at the end of the abdomen. This character, together with the above colour distinctions and the narrower pronotum, will easily distinguish it from *P. cursitans*. In its macropterous form it is said to be most like *P. formicetorum*. It is recorded by Reuter (13) from France (Rouen, *in navibus*) and from North Italy. According to Dodero it lives on *Sesamum*." E. A. Butler, November 7th, 1906.] From E.M.M., January, 1907, pp. 14, 15.

There is not yet any evidence that this insect has established itself in this country, and hence it is not included in the British List.

227. **Temnostethus pusillus** H. S.

H.S. Nom. Ent., i, 60 (1835) ; D. & S., B.H 493 (1865) ; Saund., H.H.B.I. 194 (1892).

Ova. Unknown.

Larvae. I have some larvae in two instars, taken at Royston on the bark of a tree, which I think must belong to this species. Later instar, $1\frac{3}{4}$ mm. Shining reddish pitchy with tibiae yellowish ; head long triangular ; pronotum trapezoidal, anterior angles rounded ; wing-pads very short ; metanotum slightly pale ; second and third antennal joints yellowish ; rostrum long.

Younger instar, $1\frac{1}{3}$ mm. Almost identical but for its smaller size.

Life-cycle. The imago has been found from June to October, but I know nothing further as to its cycle.

Habitat, etc. This species inhabits deciduous trees and is most usually obtained by beating. It often occurs running on the bark. It is commonly brachypterous, but a considerable proportion of macropterous examples are usually met with, especially later in the year (Collins). Reuter (13) mentions the following trees : *Betula*, *Tilia*, *Quercus*, *Populus*, *Salix*, *Sorbus*, *Alnus*, etc., most of which are confirmed by British Hemipterists ; Douglas and Scott (1) adding beech. Reuter (13), however, excludes conifers, though J. E. Mason (1) found it on larch in October. This may mean that it was resorting to the conifer for the purpose of hibernation. In the Alps it is found to the height of 2000 feet. To the above list may be added *Crataegus*, *Prunus*, and *Pyrus malus*, especially when the trees are old and lichen-covered. Morley (4) records it from beneath the loose bark of pine palings. The larvae have been found under bark (Day).

Distribution. Distributed throughout Northern and Central Europe, Italy, and the Caucasus, and extending northwards to 66° 50′, it is recorded in Britain from the coast counties from Northumberland to Devon, with the exception of Durham, Essex, and Dorset, and from Cumberland, Cheshire, Derby, Leicester, Warwick, Hereford, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset; in Wales from Carnarvon, Radnor, Brecknock, and Glamorgan, and from both Scotland and Ireland.

228. **Elatophilus nigricornis** Zett.

Zett. Ins. Lap., 265, 2 (1838); Saund., H.H.B.I. 195 (1892).

I can find no information as to the early forms of this insect.

Life-cycle. The imago has been taken in June and July.

Habitat, etc. It lives exclusively on *Pinus sylvestris*, as also do several other species of the same genus belonging to the Palaearctic Fauna (Reuter, 13).

Distribution. On the Continent its area extends from Finland, the North of Sweden, through France and Germany to Switzerland and Corsica. In the British Isles it is recorded only from Scotland, where it has been taken at Perth (Reuter and Macgregor) and at Forres (Norman).

229. **Anthocoris confusus** Reut.

Reut. Mon. Anth., 71, 4 (1884); Saund., H.H.B.I. 197 (1892).

Ova. Short, cylindrical, rounded posteriorly, and obliquely truncate anteriorly; very pale yellow with a white collar.

Larvae. The larva in its last instar, 3 mm., is very like that of *A. nemoralis*, but narrower and of a reddish-brown colour, which is only faintly paler at the apex of the wing-pads; whole surface very shiny, with a few very short hairs; here and there on the abdomen some very long pale hairs, especially in the middle and on the margins; second and third antennal joints paler than first and fourth.

Previous instar. Very similar, but with shorter wing-pads; length 2½ mm.

Life-cycle. The imago is found during the greater part of the year; I have records for all the months from February to October inclusive. The newly-matured imagines are to be met with in August, which indicates a probable larval period from June and through July; those described above were taken on June 9th. The dates given suggest that the insect passes the winter as an imago.

Habitat, etc. Like most of its congeners, this insect frequents trees, especially oak, at least in Britain: according to Reuter (13), on the Continent it shows a preference for poplar. In winter it has been found beneath pine-bark (Morley, 4), and on lichen-covered tree-trunks (W. E. Sharp, Whittaker). It has been accused of damaging hop-plants, as well as of feeding upon the Aphides which infest those plants (Theobald, 1).

One specimen that I have shows a curious malformation of the left antenna, the second joint of which is of uniform thickness throughout and entirely dark, whereas the right antenna is normal, with the second joint narrowed at base and pale in the middle.

Distribution. It occurs chiefly in Europe and Siberia. It is widely distributed in the British Isles, being recorded from thirty-four English counties, i.e. from all except Northumberland, Lancs, Staffs, Rutland, Hunts, and Worcester; from Carnarvon, Radnor, Glamorgan, and Carmarthen in Wales, and from both Scotland and Ireland. As it was for a long time not distinguished from *A. nemoralis*, no doubt some of the records for that species should be read as including this also; in fact, in many places *A. confusus* seems to be the commoner of the two.

230. **Anthocoris nemoralis** Fab.

Fab., E.S., iv, 76, 35 (1794); D. & S., B.H. 496 (1865); Saund., H.H.B.I. 198 (1892).

Ova. Unknown.

Larvae. An early, probably second, instar, 1½ mm. Ovate, pitchy brown, shining and nearly glabrous; antennae four-jointed, second and fourth joints sub-equal, third shorter, but longer than first; antennae, legs and rostrum stout; tarsi two-jointed, first joint very small.

Later instar, 2–2¼ mm. Similar to preceding, but with wing-pads appearing; these have a rather paler spot at outer angle; fore parts and legs rather paler than abdomen. The whole surface with a few scattered, rather long, pale hairs.

Later instar, 2½ mm. Similar to preceding, but with wing-pads longer, extending to about one-third of third abdominal segment; pale spot on wing-pads more distinct; pronotum trapezoidal, narrowed in front, and with anterior angles rounded; second antennal joint longer; lateral margin of wing-pads convex, projecting beyond the general outline of the body.

Life-cycle. The imago has been found from May to October; the insects of the year are produced in August, and it seems probable, therefore, that the specimens found earlier than this are over-wintered ones. Blathwayt says it is found in winter under bark and stones.

Habitat, etc. Bold says this species is a great devourer of Aphides, and Blathwayt adds: "I have known one suck and kill a spider larger than itself." I once found it swarming on a very much Aphis-infested sallow bush at Carmarthen in August. Douglas and Scott (1) report that like *A. nemorum*, it is often found in the bladdery mines made on oak leaves by the larvae of Microlepidoptera of the genus *Lithocolletis*. It seems to be less common than the preceding species, but it is found on a much larger variety of trees and shrubs. The most usual are perhaps sallow and alder. Reuter (13) gives also *Populus*; J. E. Mason (1) *Hippophaë*; Dalla Torre elm and beech; Morley (4) nettles. I have found on box at Box Hill and elsewhere a form which apparently belongs to this species, but is rather larger and of stouter build, though the antennae are usually more slender and rather longer; the hoary incrustation on the clavus and corium is also rather more distinct. this incrustation is called by Saunders (29) a pubescence; this cannot be regarded as a correct term for it as there is no trace of hairs in its composition; it appears simply as a kind of incrustation, though there is a pubescence in addition. Were it not that there is some irregularity in the antennae, this might rank as a distinct species, especially as there is some difference in the larvae.

J. E. Mason (1) found this species more abundant in Lincolnshire near the sea than inland, in contrast with *A. nemorum*. The pale-coloured form is the var. *superbus* Westh.

Distribution. Of general distribution on the Continent and passing into Tunisia, Asia Minor and Syria, it is recorded in Britain from thirty-one English counties, viz. all except Staffs, Salop, Rutland, Leicester, Beds, Northants, Warwick, Monmouth, and Dorset; from Carnarvon, Glamorgan, and Carmarthen in Wales, and from both Scotland and Ireland. It is probably of perfectly general distribution. In the Alps it reaches a height of 6000 feet.

231. **Anthocoris gallarum-ulmi** De G.

De G. Mém., iii, 279, 23 (1773); Saund., H.H.B.I. 198 (1892).

Ova. Unknown.

Larvae. Last instar, $3\frac{1}{4}$ mm. Very similar to that of *A. nemoralis*, but rather broader, with thinner antennae and with the pale spots at apex of wing-pads not quite so distinct.

Life-cycle. The imago has been taken from April to August, and in December. I have found a larva in its last instar at the beginning of August.

Habitat, etc. It lives in trees and is obtained by beating. According to Reuter (13) it is found on elms in the galls made by the aphis *Schizoneura ulmi*, where it sucks the excrement of the Aphides. According to De Geer it is found also on the leaves of currant and gooseberry bushes which have been deformed by Aphides. Carr reports it from oak, but in this country it generally occurs on elm. In the net it can usually be distinguished without much difficulty by its larger size and its more uniform coloration.

Distribution. It is probably generally distributed on the Continent, though, as it has often been confused with *A. nemoralis*, its exact distribution cannot be fixed with accuracy. It is also reported from Egypt. In Britain it has been recorded from twenty counties, viz. Cumberland, Yorks, Cheshire, Derby, Notts, Leicester, Cambs, Hereford, Oxon, Bucks, Herts, Berks, Middlesex, Surrey, and the South Coast counties from Kent to Cornwall. The only Welsh record is from Glamorgan, where Hallett took a specimen in December. I have received it from Kingussie in Scotland, but there are no records for Ireland.

232. **Anthocoris sarothamni** D. & S.

D. & S., B.H. 497 (1865); Saund., H.H.B.I. 199 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken from July to September, and also in January (Billups, 3) and April (Morley, 4). The insects of the year mature early in August, or perhaps late in July. The other records plainly indicate hibernation in the imago condition.

Habitat, etc. This species is found on broom (*Sarothamnus scoparius*). Morley (4) beat it from a dead fir hedge in April, where it may have been still in hibernation.

Distribution. On the Continent it is recorded only from the central and south-west parts. In Britain the records are from a few counties only, viz. Northumberland, Cumberland, Cheshire, Lincs, Norfolk, Suffolk, Herts, Kent, Surrey, Berks, Sussex, and Hants, and from Perth and Forres in Scotland (E.M.M., xvi, 13). But there are no records from either Wales or Ireland.

233. **Anthocoris visci** Dougl.

E.M.M., xxv, 427; Saund., H.H.B.I. 199 (1892).

Ova. Unknown.

Larvae. Last instar, 2 mm. Ovate, broadest a little behind middle of abdomen; head, pronotum and scutellum orange-red, wing-pads brownish, yellowish-white at apex; base of abdomen between wing-pads yellowish-white; abdomen crimson, sometimes with small black bars in region of scent-glands; antennae with first two joints orange-yellow, last two, which are very short and subequal, reddish-brown; legs orange-yellow with basal half of tibiae reddish, tarsi greenish-yellow; head triangular with central lobe of face very large; pronotum trapezoidal, much narrowed in front, with lateral margins much rounded anteriorly; underside orange-yellow; a few fine white hairs on abdomen.

Life-cycle. The imago has been taken from August to October.

Habitat, etc. This little species inhabits mistletoe, in company with *Lygus viscicola* and *Psylla visci*; but in my experience, although the two latter species are abundant where found, the *Anthocoris* is exceedingly scarce. Its food would probably be the *Psylla*.

Distribution. On the Continent it is recorded only from France and Spain (Bueno). In Britain it has occurred in three counties only, Norfolk, Hereford, and Dorset. In the orchards of Hereford mistletoe grows in large quantity, and affords abundant opportunities for the development of this insect, of which, however, it does not seem to have made so much use as might have been expected, although the other two mistletoe Hemiptera are abundant there.

234. **Anthocoris nemorum** Lin.

Lin., F.S. 953 (1761); D. & S., B.H. 495 (1865); Saund., H.H.B.I. 199 (1892) (sylvestris).

Ova. Length about ½ mm. Pale yellowish-white; a short and rather broad straight cylinder, rounded posteriorly, and anteriorly with a white circular collar of smaller diameter set slightly obliquely upon it; the whole surface corrugated.

Larvae. In all its instars this insect can be distinguished from the other species of the genus by the greater length and slenderness of the antennal joints, and, in the last instar, by the paler wing-pads.

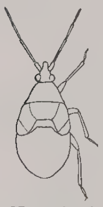
1st instar, 1 mm. Shining red, with metanotum mainly pale yellowish; widest at middle of abdomen; legs and antennae brownish, the latter paler at base; first and third joints of antennae shortest, subequal; second and fourth joints subequal; of the thoracic segments the pronotum is narrowest, and rounded at lateral margins, mesonotum very transverse, as wide at base as pronotum, lateral margins straight, diverging, metanotum also very transverse, as wide as posterior margin of mesonotum, sides straight and nearly parallel.

2nd instar, 1½ mm. Similar to above, but with antennae longer and legs a little paler, and pale colour of metanotum chiefly at outer extremity.

3rd instar, 1¾–2 mm. Similar to second, but with antennae still longer, legs paler, body with a pitchy tinge, and pale part of metanotum less distinct (this latter may result from discoloration after death).

4th instar, 2½ mm. Similar to third, but with antennae still longer and more slender, and body more pitchy; first trace of wing-pads seen.

5th instar, 3 mm. Body entirely pitchy; pronotum with lateral margin much rounded in front, slightly sinuate in middle, and angular behind, where it is broadest, posterior angles testaceous; wing-pads distinct, outwardly triangularly testaceous; insect broadest at about a third from base of abdomen; legs testaceous, with base of femora and more or less of tarsi infuscated; antennae long and slender, with basal and apical joints, extreme base of second and extreme apex of third dark; rostrum pitchy; the antennae, though slender, are not quite so slender as in the adult.


Nymph of *Anthocoris nemorum* L.

Life-cycle. The imago of this species may probably be found throughout the year. I have records for all the months except January, February, and November. The insects of the year mature in August, and the spring specimens are, no doubt, over-wintered ones.

Habitat, etc. This is unquestionably one of the commonest and most widely distributed Hemiptera we possess. It occurs also on a great variety of trees and shrubs, as well as on the flowers of many low plants. In all these localities it no doubt preys upon other insects inhabiting the same quarters, although it does not appear to be wholly carnivorous. Stainton found it sucking the larvae of Microlepidoptera belonging to the genus *Lithocolletis*

(Douglas and Scott, 1). These larvae are leaf-miners, and Douglas says that the Hemipteron has been found in the bladdery mines so caused on the leaves of oaks; Stainton's specimen was outside the mine, and reached its victim by thrusting its rostrum through the loosened lower cuticle of the leaf. Reuter (13) found it sucking a dead cockchafer (*Rhizotrogus*). Bold says it is a great devourer of Aphides.

While its normal food seems to be of an animal nature, it has been accused of doing harm to hop-plants by puncturing the leaves and tender shoots. Amongst hop-growers, it is known as the "Needle-nosed Flea," and Theobald (3) distinctly states that it both harms the hops by puncturing the leaves, and also benefits them, by feeding on the Aphides which infest the plants in great numbers.

It sometimes falls a prey itself to other insects; Donisthorpe observed that in Pamber Forest on May 30th, 1903, it was captured and devoured by the ♀ of an *Asilid* fly *Neoitamus cyanurus* Lw. (Poulton).

It is not infrequently observed hiding in various retreats; thus Blathwayt says that in winter it is found under bark and stones, and Parfitt, "under leaves and the dead bark of trees"; Tuck discovered it in a nest of *Bombus agrorum*. In March, 1910, I found it on fir trees at Carmarthen, where it was no doubt wintering. J. E. Mason (1) noted that it was less abundant in Lincs near the sea than inland.

It seems likely that this insect may be an agent in securing cross-fertilisation of plants. I was favoured by the late Rev. E. A. Woodruffe-Peacock with a list of seventeen plants, on the flowers of which he found the insect, in all cases with pollen grains attached to it. The list is as follows:—

Cruciferae.	Thlaspi arvense.
	Brassica arvensis.
Rosaceae.	Rubus fruticosus.
Umbelliferae.	Pimpinella major.
	Daucus carota.
	Foeniculum vulgare.
Compositae.	Taraxacum officinale.
	Carduus crispus.
	Cnicus arvensis.
	Aster tripolium.
	Pulicaria.
	Achillea millefolium.
Convolvulaceae.	Convolvulus arvensis.
Solanaceae.	Solanum tuberosum.
Primulaceae.	Primula vulgaris.
Labiatae.	Lamium album.
Euphorbiaceae.	Euphorbia helioscopia.

It is capable of inflicting a sharp prick with its rostrum upon the human hand.

Reuter (13) points out that in this species the margins of the orifices of the scent-glands are raised and thickened, thus differing from the other British species. I have a specimen taken in August which is burdened with a large number of parasitic mites.

Distribution. Its area spreads all over Europe up to 70° N. lat., and includes also the whole of Siberia, Asia Minor, and the Palaearctic parts of North Africa. It is exceedingly common in Britain and occurs in almost all published lists. I have records for thirty-two English counties, i.e. all except Staffs, Salop, Worcester, Rutland, Hunts, Beds, Northants, and Monmouth; for five Welsh counties, Carnarvon, Radnor, Brecknock, Glamorgan, and Carmarthen; and also for Scotland and Ireland. In the Alps it reaches the height of 3000 feet (Frey Gessner).

235. **Anthocoris limbatus** Fieb.

Fieb. Weit. Beitr., 110, 13, t. 2, fig. 9 (1836); E.M.M., xliii, 233.

This insect resembles *A. nemorum* in having the hemielytra entirely shining, but differs in its smaller size ($3\frac{2}{5}$–$3\frac{1}{2}$ mm.), in having the third antennal joint distinctly shorter than the fourth, the legs entirely flavescent, and the whole of the basal part of the pronotum pale flavo-testaceous.

Ova. Unknown.

Larvae. Last instar, 2 mm. Very much like that of *A. nemorum*, except for its smaller size; body reddish pitchy, with base of pronotum tinged with testaceous, and outer triangle of wing-pads clear testaceous; legs as in *A. nemorum;* the antennae are mutilated in the only specimen I have.

Life-cycle. The imago has been taken in August and September, and the larva in its last instar also in September.

Habitat, etc. It is found on *Salix*, but on the Continent is recorded also from *Pinus* sp. (Carpenter and Dubois).

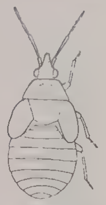
Distribution. It occurs throughout Europe and Siberia. In Britain it has hitherto been found in one county only, viz. in Surrey, at Byfleet and Woking. In the Alps it reaches the height of 3000 feet (Frey Gessner).

236. **Tetraphleps vittata** Fieb. (T. bicuspis H.S. Osh. Cat.).

Feib. Weit. Beitr., 108, 10, t. 2, fig. 6 (1836); D. & S., B.H. 491 (1865); Saund., H.H.B.I. 200 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{1}{2}$ mm. Ovate, flattened, entirely shining piceous, with a very short and scattered pilosity; pronotum trapezoidal, with anterior angles rounded and lateral margins slightly sinuate; disc smooth, margins broadly rugose; integument irregularly wrinkled; face produced beyond first antennal joint; wing-pads extending half-way across third abdominal segment; second antennal joint longest; tarsi two-jointed, basal joint very small, claws small; lateral margins of wing-pads convex, projecting beyond the general outline of the body.



Nymph of *Tetraphleps vittata* Fieb.

Life-cycle. The imago has been found from April to October. I have found the full-grown larvae in August.

Habitat, etc. This insect inhabits conifers and principally larches. McGregor found it on spruce fir, and on the Continent it has occurred on *Pinus strobus*, *P. sylvestris*, and *Picea excelsa* as well as larch (Reuter, 19). If one remembers that its food is probably Aphides and other small insects, this diversity of habitat will not seem remarkable.

Distribution. It is generally distributed on the Continent, and in Britain it is recorded from the coast counties extending from Durham to Devon, except Essex and Dorset, and also from Cumberland, Notts, Leicester Oxon, Bucks, Herts, Middlesex, Surrey, Berks, Wilts, Somerset, and Glo'ster. The only Welsh record is from Glamorgan. There are none from Ireland, but it is found in Scotland. In the Swiss Alps it is found to the height of 7000 feet (Frey Gessner), and in the Tyrol to 8000 feet (Gredler).

237. **Acompocoris pygmaeus** Fall.

Fall. Mon. Cim., 73, 21 (1807); D. & S., B.H. 492 (1865) (lucorum); Saund., H.H.B.I. 201 (1892).

Ova. Unknown.

Larvae. Last instar, 2½ mm. More or less castaneous-brown with head and pronotum often more or less testaceous; wing-pads outwardly testaceous, inwardly assimilated to colour of abdomen; legs and antennae more or less testaceous, femora sometimes darker; eyes reddish. The colour is bright red just after the moult, with contents of intestine showing black.

Life-cycle. The imago has been found from June to October, and on the Continent in April.

Habitat, etc. This species inhabits coniferous trees exclusively, and in this country almost always Scotch fir. On the Continent it has a wider range and is found not only on *Pinus sylvestris*, but also on *Pinus strobus*, *Picea excelsa*, *Larix europaea*, and *Abies* sp. In Siberia it occurs also on *Abies sibirica* (Reuter, 19).

It is, of course, carnivorous and no doubt feeds upon Aphides, etc.

Distribution. Distributed throughout Northern and Central Europe, and up to 68° 40′ N. lat.; it extends also into the Caucasus. It is recorded from Britain from the coast counties, extending from Yorks to Glo'ster, except Dorset, and also from Cumberland, Westmorland, Lancs, Cheshire, Notts, Leicester, Worcester, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts. The records from Wales are from Carnarvon, Carmarthen, and Glamorgan. It occurs in both Scotland and Ireland. In the Swiss Alps it rises to a height of 3500 feet (Frey Gessner), and in the Tyrol to 6000 feet (Gredler).

238. **Acompocoris alpinus** Reut.

Reut. Gen. Cim. Eur., 63 (1875); Saund., H.H.B.I. 202 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. Of the life-cycle of this species I can find no records save that the imago has been taken in August.

Habitat, etc. In Britain it is found on the Scotch fir. On the Continent it inhabits *Picea excelsa* in the north, and *Pinus montana* or *P. pumilio* in the centre; in Siberia, again, it is found on *Abies sibirica*, *Picea excelsa* and *Pinus cembra* (Reuter, 19). J. Sahlberg gives also larch. It is usually a darker insect than *A. pygmaeus*.

Distribution. This species is much less common than the preceding. It is recorded from Northern and Central Europe and Siberia, extending as far north as 69° 50′. In England it has occurred in eight counties, Norfolk, Suffolk, Surrey, Sussex, Hants, Berks, Oxon, and Hereford; it has also been found at Forres in Scotland, but there are no records for Wales or Ireland. Possibly the scantiness of these records may be partly due to the difficulty of distinguishing it from the preceding species.

239. **Triphleps nigra** Wolff.

Wolff. Ic. Cim., 167, fig. 161 (1804); D. & S., B.H. 502 (1865); Saund,, H.H.B.I. 203 (1892).

Ova. Unknown.

Larvae. Last instar, 1½ mm. More or less reddish testaceous, with wing-pads and abdomen often infuscated. Legs and antennae testaceous; eyes reddish-black; shape oval, head triangular, pronotum trapezoidal, transverse; wing-pads not extending beyond second abdominal segment; tarsi two-jointed, basal joint very small, claws very small; antennae four-jointed, showing the sexual difference which appears in the adult.

Life-cycle. The imago has been found from April to October and also in February. The insects of the year mature at the end of July or beginning of August.

Habitat, etc. This species is found in Britain usually upon heath (*Erica* and *Calluna*), but I have found it common in Herefordshire, in a district where there is no heath for miles around. J. Edwards records it from furze bushes when in bloom, and Parfitt found it on flowers by the side of woods. Douglas and Scott (1) give also *Ulex nana*, and on flowers of *Anthemis cotula*. I have found it also at the roots of plants on a wayside bank in the Isle of Wight. According to Reuter (13) it occurs amongst

Aphides on various plants, especially *Chenopodium*, *Artemisia*, *Cirsium*, *Lappa*, *Achillea*, *Ulex*, etc. Jakowleff reports it from dry dung. Bergroth (3) mentions its occurrence in the nests of the ant *Acanthomyops flavus.* It is extremely variable in coloration, but may usually be distinguished by the dark posterior tibiae; even this character, however, sometimes fails, and then the convex nature of the pronotal callosity may be relied on for the ♀, while the ♂ can always be distinguished by the thickened antennae. Reuter describes seven varieties.

Distribution. While generally distributed throughout Europe up to 63°, its area extends to the North of Africa and to Syria and Turkestan. In Britain it is recorded from the coast counties extending from Norfolk to Glo'ster, except Essex; and also from Yorks, Notts, Warwick, Hereford, Oxon, Bucks, Berks, Middlesex, and Surrey; the only records for Wales are from Carnarvon and Glamorgan, and there are none from either Scotland or Ireland, so that its northernmost limit is Yorks. In the Alps it rises to the height of 3000 feet (Frey Gessner).

240. **Triphleps majuscula** Reut.

Reut., E.M.M., xvi, 15 (1879); Saund., H.H.B.I. 203 (1892).

Ova. Unknown, but see the next species.

Larvae. I have a larva which I think belongs to this species, and which is $1\frac{3}{4}$ mm. in length, oval, of a shining piceous colour with the head a little lighter, and the legs and antennae testaceous.

Life-cycle. The imago has been found from May to October, and in February; in winter it occurs under oak bark. The above-mentioned larva was taken in August. The insects of the year certainly mature about August.

Habitat, etc. It is found commonly by sweeping all kinds of plants, especially in damp places. It is often abundant on the flowers of *Angelica sylvestris.* It has also occurred in the nests of *Vespa vulgaris* and *Bombus agrorum* (Tuck). Parfitt found either this species or the next under dry seaweeds on the shore, and Morley (4) has found it occasionally under oak bark in winter. I have received a specimen from Mr. Hugh Main, which he found in February hibernating in an apple which came from Norfolk.

Distribution. In Oshanin's Catalogue it is said to be found throughout Central and Southern Europe and in S. Russia and Syria. In our own country it is recorded from twenty-six English counties and one Welsh. These are the coast counties from Yorks to Cornwall, except Dorset, together with Lancs, Cheshire, Notts, Cambs, Hunts, Beds, Northants, Warwick, Worcester, Hereford, Oxon, Herts, Middlesex, Surrey, Berks, Wilts, and Carnarvon. There are no records from either Scotland or Ireland, so that its northernmost limit thus far is Yorkshire.

241. **Triphleps minuta** Lin.

Lin., F.S. 941 (1761); D. & S., B.H. 504 (part) (1865); Saund., H.H.B.I. 204 (1892).

Ova. Capt. Xambeu has described the eggs thus: "They measure 0.3 mm. in length and 0.1 mm. in breadth; they are elongate cylindrical, of a pale shining green colour, rounded at one end and truncated at the other, and with a delicate shell. They are laid in small batches."

Larvae. These when disclosed from the egg are at first whitish, but become gradually brownish-black (Xambeu).

Life-cycle. The adult has been found from July to November and also in May. According to Xambeu, fecundation takes place in August and oviposition rapidly follows; the eggs are laid (in France) in the midst of the flowers of "*Panicant.*" They are hatched in less than eight days.

Habitat, etc. It is found by sweeping herbage promiscuously. Xambeu says that it occurs in France on *Eryngium campestre*, and that it lives upon the juices of flowers. According to Reuter (13) it frequents colonies of Aphides, especially those of the species *Aphis rubi*, *A. mali*, *A. salicis*, *Lachnus bursarius*, etc. J. Edwards (1) says it is found on furze bushes when these are in bloom. Dalla Torre gives *Silene inflata* and *Anthyllis vulnerata* in June and July. These last two records may refer to either the preceding or the present species.

As the last two species are very much alike, it may be useful to give Reuter's diagnosis in full:

"*T. minuta* L. Pronotum with the sides towards the apex *more rounded* and *extended* (♀) or almost straight, and only at the angles more rounded (♂), in the anterior two-thirds finely margined; the apical angles deflected and provided with a foveola without any anterior border; the apex between these angles, immediately behind the narrow apical constriction ("apical ring"), about three-fifths, almost one-half narrower than the base; the disc with a narrow median *callus*, which occupies only *two-fourths* of the width of the pronotum at this place, the lateral limb thereof being *broad;* the disc behind the callus *strongly and densely wrinkled and punctured*, the punctuation *on the middle and sides equal;* hemielytra pale testaceous, unicolorous, or only with the cuneus more or less piceous, more rarely also the base of the clavus is of this colour.

"*T. majuscula* Reut. *Larger;* pronotum with the sides towards the apex *very much narrower*, rather *slightly rounded*, anteriorly *narrowly extended*, almost as far as to the posterior angles acute and finely margined; the apical angles deflected and provided with a foveola; the apex between the angles, immediately behind the apical ring, four-sevenths or almost one-third narrower than the base; the disc with a *broad* callus, which is greatly extended towards the sides, making *the greatest part of the breadth* of the pronotum at this place; the lateral limb therefore between the callus and the margin being *narrow;* the disc behind the callus only *in the middle* transversely wrinkled, toward *the more shining sides rather strongly but less densely punctured*, the basal limb and the angles themselves smooth ; hemielytra *very distinctly* punctured, pale testaceous, mostly with at least the cuneus and *the apex or the whole commissure of the clavus* piceous."

Distribution. It is found throughout the Palaearctic Province, extending through Siberia to China. In Britain it has been recorded from the coast counties extending from Yorks to Glo'ster, with the exception of Dorset, and from Cumberland, Lancs, Cheshire, Notts, Cambs, Warwick, Hereford, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts. Some of these records may possibly refer to the preceding species. There are no records from either Wales, Scotland, or Ireland. In the Alps it rises to a height of 3000 feet (Frey Gessner). According to Oshanin, it is more widely distributed than the preceding species, but with us *T. majuscula* seems the commoner.

242. **Brachysteles parvicornis** Cost.

Costa, Regn. Neap. Cent. II, 27, 3 (133), t. 3, f. 6 (1843) ; D. & S., B.H. 506 (1865) (pilicornis) ; Saund., H.H.B.I. 205 (1892).

Ova. Unknown.

Larvae. In its last instar the larva is reddish-brown, with connexivum yellowish, and pale flavous legs and antennae, the terminal joints of the latter being slightly fuscous. In shape it is similar to the imago.

Life-cycle. The imago has been found from June to October and the larva in August.

Habitat, etc. I have found this species in June on a gravelly patch on the Deal sandhills, where dwarf specimens of *Trifolium repens* were scantily growing, and in August, when it had evidently just matured, running on a muddy patch at Totland Bay, I.W., where rushes were growing very scantily. E. Saunders took it under a low elm hedge, and Morley (4) swept it in a wood. Reuter (13) says it occurs on marsh plants, under the bark of trees, etc. Of course this variety of habitat points to a carnivorous diet. It is an inconspicuous insect, but still sufficiently distinct from other *Anthocoridae* to be able to be recognised without much difficulty. The short stumpy shape and the abundant pubescence should lead to its ready identification.

Distribution. Its area is given by Oshanin as Central and Southern Europe and Northern Africa. In Britain it is recorded only from Suffolk, Kent, the Isle of Wight, and Dorset. It is evidently, therefore, a rare species.

243. **Cardiastethus fasciiventris** Garb.

Garb. Cat. Hem. El. It., 123 (1869) ; D. & S., B.H. 507 (1865) (testaceus) ; Saund., H.H.B.I. 206 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from April to July. On the Continent d'Antessanty found it in October and Horváth in December.

Habitat, etc. This is another insect of rare occurrence, and one, therefore, concerning the habits of which very little is known. It has been taken by sweeping weeds, and also by beating hawthorn and fir trees (Morley, 4). Puton says it occurs on *Pinus*, and Costa found it under bark. D'Antessanty took it by beating faggots of oak in October, and Horváth found it in December on *Abies* (Reuter, 19). Its testaceous colour should enable this insect to be easily recognised.

Distribution. This species is widely distributed but always rare. It belongs to Central and Southern Europe and Northern Africa ; in Britain it is recorded only from Suffolk, Middlesex, Kent, Surrey, Berks, and Dorset.

244. **Xylocoridea brevipennis** Reut.

Reut. Pet. Nouv., ii, 55 (1876) ; E.M.M. xxxiv, 251.

Saunders (40) gives the following description : " Generically it may be distinguished from *Xylocoris*, its nearest British ally, by the shorter first and longer second joints of its rostrum, by the long fourth joint of the antennae, which is much longer than the third (this latter being unusually short), and by the more remote position of the eyes from the anterior margin of the pronotum, as well as by its abbreviated elytra.

" It is an elongate, rather flat insect, with very shining black head, thorax and abdomen with a few scattered long hairs, and dull, slightly paler elytra ; the eyes are situated nearly in the centre of the sides of the head, being about equidistant from the apex of the pronotum and of that of the face ; the second joint of the antennae is pale and slightly thickened, and dusky towards the apex ; pronotum narrow, with a slight apical constriction, lateral margins carinated, slightly reflexed and curved, tending to become sinuate just before the posterior angles, which are acute, base widely emarginate ; elytra about as long as the pronotum and half the head, dull, with the embolium alone shining, clothed with a sparse, sub-erect pilosity, membrane reduced to a mere strip ; abdomen a good deal wider than the elytra, sub-oval ; legs, with the femora, blackish-brown, tibiae slightly paler. L. 2.5 mm."

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from February to April and also in September.

Habitat, etc. It is a sub-cortical species, found under hawthorn bark.

Distribution. On the Continent it has been taken in France, Spain, and Italy. In Britain it has occurred in three localities only, Mr. Morley found it in Richmond Park, Surrey (March, 1898), and Framlingham, Suffolk (April, 1901), and Dr. Hugh Scott at Swanage (1919).

245. **Xylocoris ater** Duf.

L. Duf. An. Soc. Ent. Fr., ii, 106, 2, p. 6 B, fig. 3 (1833); D. & S., B.H. 508 (1865); Saund., H.H.B.I. 207 (1892).

Ova. Unknown.

Larvae. These are bright red (Morley, 4).

Life-cycle. Blatch records finding the imago "during the first four months of the year," and Douglas and Scott (1) "nearly all the year round." I have definite records for June, September and October, and there are continental ones for August.

Habitat, etc. Like the preceding, it is a subcortical species, but is found generally under the bark of coniferous trees; it has also been recorded from under the bark of *Pyrus communis* (Reuter, 13). Its habits are probably similar to those of *Piezostethus cursitans*.

Distribution. It is distributed throughout the Continent and in Syria, and occurs also in N. America. In Britain it is recorded from Norfolk, Suffolk, Cambs, Warwick, Oxon, Essex, Kent, Surrey, Sussex, and Devon, but there are no records from either Wales, Scotland, or Ireland.

Sub-family IV. **Microphysina.**

This small group, treated in the latest British Catalogue as a part of the Anthocorina, contains half a dozen British species, which are sufficiently different from the rest of the Anthocorina to justify their separation as a distinct sub-family, separable by the four-jointed rostrum and the two-jointed tarsi, their allies having three joints in each. They are further distinguished by a striking sexual dimorphism, which has no parallel in the Anthocorina. The ♂♂ are fully winged, and are much like the Anthocorina in shape, but the ♀♀ have merely rudimentary hemielytra and no wings, and are altogether unlike their mates in form, having the abdomen very broad and convex, evidently specially modified for the production and accommodation of eggs. Further, the ♂♂ are far less numerous than the ♀♀, and are comparatively seldom seen; they probably exist for but a short time, and the proportion of their numbers is such as to raise a presumption that parthenogenesis must frequently take place. They frequent trees and shrubs, especially old and dry ones, and the ♀♀ might easily be passed over as larvae, especially in *Myrmedobia*. They occur most frequently *on* and not under the bark of trees, and are probably carnivorous.

An interesting question arises as to the purpose of the dimorphism, but no light seems possible upon it as yet. The ♂♂ appear somewhat earlier than the ♀♀, but it will hardly be supposed that this is to give a chance of sexual selection.

246. **Microphysa pselaphiformis** Curt.

Curt., E.M.M., i, 198 (1833); D. & S., B.H. 487 (1865); Saund., H.H.B.I. 208 (1892).

Ova. The only egg I have seen is one which I took from the body of a

♀, and most curiously this egg shows the embryo already nearly escaped, with only about a quarter of its body still in the egg; this peculiar position while the egg is still within the body of the parent is strongly suggestive of an ovo-viviparous arrangement, by which the insect would be born alive and free instead of as an egg. The egg itself is large enough to occupy about one-third of the abdominal space, so that if many are produced it must be in succession and not synchronously.

Larvae. Rather like that of an Anthocorid and bright red (Hallett.)

Life-cycle. I have found the ♂♂ at the beginning of June, when they were only just mature; the ♀ occurs from May to August, but what becomes of them in the rest of the year is at present a mystery.

Habitat, etc. I have found the ♂ on old hawthorn hedges and the ♀ on the trunks of lime trees, and it has been taken also by beating hawthorn shrubs and faggots and on palings. J. E. Mason mentions trunks of sycamore trees, and McGregor found it on juniper; Saunders adds that it occurs sometimes under bark. According to Reuter (19), it is found also on *Pinus*, in forest pastures, on flowering trees, on palings, under bark, etc. It probably feeds on minute insects. Hallett has observed this insect in all its stages issuing from the burrows of the beetle *Scolytus rugulosus* in blackthorn, where it was evidently " at home," so that it probably fed on the larvae of the beetle. The ♂ is always fully winged, while the ♀ has scale-like hemielytra which extend about half-way down the abdomen. The ♂ of this species has been in my experience relatively more numerous than that of any other of the Microphysina.

Distribution. Of general distribution on the Continent up to 67°, and extending into Palestine and Algeria, it is recorded in Britain from all the coast counties stretching from Northumberland to Dorset, except Durham, and also from Cumberland, Notts, Leicester, Warwick, Oxon, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset; the only record from Wales is Glamorgan (Hallett), and it has been found in Scotland but not in Ireland.

247. **Microphysa elegantula** Baer.

Baer., B.E.Z., ii, 191, t. 2, fig. 3 (1858); D. & S., B.H. 488 (1865); Saund., H.H.B.I. 208 (1892).

Ova. Length about $\frac{1}{3}$ mm. Short and broad, rounded posteriorly, truncate at right angles anteriorly, with dark brown crenulate free edge; general colour yellow.

Larvae. Undescribed.

Life-cycle. The ♂ has been found in July, and the ♀ from June to September, chiefly in the last two months of this period, but for the rest of the year our knowledge is a blank.

Habitat, etc. The habits of this insect are similar to those of the preceding. The ♀ has been found on the bark of lime trees, black poplar, oak, and sycamore. It occurs also by beating various trees, especially those that are old or lichen-covered, and beneath the bark of pine palings. Halbert obtained it in Ireland by beating old lichen-covered sloe bushes, and I have found it on old apple trees, and by beating faggots. Puton says it occurs on *Pinus* and Reuter in hedges. The latter also found it associated with the ant *Acanthomyops fuliginosus* Latr., but such association has not yet been observed in this country, notwithstanding Mr. Donisthorpe's patient investigations.

I once beat some specimens from dead trees at Carmarthen, in which the fore parts were more or less fuscous instead of the usual testaceous red, the legs rather darker than usual, the abdomen broader, and the pubescence much longer and more distinct. I submitted one of these to Dr. Horváth of Budapest, hoping they might prove to be a distinct species, but his opinion was that they were only a var. of *M. elegantula.*

As a continental species *M. bipunctata* Perr. is recorded by Perris as feeding upon *Acari* and *Podurae,* it is probable that similar habits pertain to the present species.

I have found the ♂ running on a decaying log, but this sex is in my experience certainly decidedly rare, while the ♀ is by no means uncommon, and sometimes quite abundant on tree trunks.

Distribution. Distributed throughout the Continent, though apparently nowhere very common, it is recorded in Britain from all the coast counties from Durham round to Somerset, as well as from Lancs, Notts, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts ; in Wales from the counties of Carnarvon, Carmarthen, and Glamorgan. It is also recorded from Ireland, but not from Scotland.

248. **Myrmedobia tenella** Zett.

Zett. Faun. Ins. Lap., 475, 3 (1828) ; Saund., H.H.B.I. 211 (1892).

Ova. Unknown.

Larvae. I have found a larva amongst a number of adult ♀♀. It is black and much more elongate than the ♀ ; of course, it may have been a ♂, but as it was found amongst ♀♀ and as the ♂ probably matures somewhat earlier than that sex, the chances are against that presumption. Reuter (19), however, describes the larvae as red ; this may refer to a younger stage, or to a teneral condition.

Life-cycle. The ♀ has been taken in June, August, and September, and the ♂ in August. The above-mentioned larva was found in August.

Habitat, etc. I have found the ♀ of this species in moss, and have also taken it by beating. Reuter (19) gives as its habitat meadows and coniferous trees, the latter especially for the ♀ ; he adds also that the ♂ is found in grassy places, and the ♀ amongst moss and lichen in fir woods ; in this latter habitat, the larvae occurred also. He found the ♀ on *Picea excelsa* and *Pinus* *sylvestris*, and Fieber (2) beat the ♂ from juniper. Raddatz took this species on oak.

Distribution. While generally distributed in Northern and Central Europe, and extending its range even into Siberia, it is recorded in Britain from two compact English areas containing the six counties, Norfolk, Suffolk, and Cambs, Middlesex, Surrey, and Hants, from the two Welsh counties of Carnarvon and Carmarthen, and from both Scotland and Ireland ; it is the only one of the genus that has been found with us outside the limits of *English* counties.

249. **Myrmedobia distinguenda** Reut.

Reut. Mon. Anth., 184, 2 (1884) ; Saund., H.H.B.I. 211 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. I have taken the ♂ in June, July, and August, and the ♀ in July and August.

Habitat, etc. The ♂ occurs by sweeping in grassy places, and the ♀ I have obtained by beating an old hawthorn hedge, by beating thatch, and by general sweeping. Montandon found the ♀ on *Abies*, Saunders (29) on old lichen-covered larches, and Reuter (19) on *Pinus silvestris* and *Picea excelsa*. Montandon also records it from under the bark of old fir-logs, in the Carpathians.

Distribution. On the Continent it is recorded from Finland, France, and the Carpathians. In Britain it has occurred in Norfolk, Suffolk, Essex, Kent, Middlesex, Surrey, Hants, Berks, Oxon, and Cornwall.

250. **Myrmedobia inconspicua** D. & S.

D. & S., E.M.M. viii, 61 (1871) ; Saund., H.H.B.I. 210 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The ♂ has been taken in July and in June in Jersey, and the ♀ in August.

Habitat, etc. This species is an inhabitant of sandhills. Saunders found the ♂ in Jersey running on the sand, and both sexes at Lowestoft (29) at the roots of grass on the sandhills. I have taken the ♀ in moss on the sandhills at Camber, near Rye, Sussex.

Distribution. I have not been able to find any continental records of this species. In Britain it has occurred in Suffolk, Sussex, Hants, Dorset, and Devon, but it is nowhere common.

251. **Myrmedobia coleoptrata** Fall.

Fall. Mon. Cim. 31, 7 (1807) ; D. & S., B.H. 484 (1865) ; Saund., H.H.B.I. 210 (1892).

Ova. Unknown.

Larvae. Last instar like the ♀ adult, with shiny black body and red head (Keys).

Life-cycle. I have found the ♂ in June and July, and Dr. Power took the ♀ in June. Douglas and Scott (1) referring to this last record, say, "*afterwards* ♂ and ♀ taken by us at the same place [Highgate Wood], several pairs being seen *in cop.*" It has also occurred in August.

Habitat, etc. This insect is more or less associated with ants. Donisthorpe (2) records it from the nests of *Myrmica laevinodis* Nyl., *Acanthomyops fuliginosus* Latr., and *A. niger* L. I have found the ♂ in the nest of *A. alienus* Först. Schiödte states that it occurs in the nests of *Formica rufa* L. and *F. sanguinea* Latr. The specimens taken by Douglas and Scott (1) were not associated with ants, although ants were on the same bank ; with these ♀♀ were also found specimens of the beetle *Alexia pilifera*, which the authors say the *Myrmedobia* closely resembled. The ♂ has also been taken by sweeping, and the ♀ under dead leaves.

Distribution. Generally distributed in Europe, and also found in Morocco, Algeria, and the Caucasus, it is recorded in Britain from six counties only, Lincs, Bucks, Herts, Middlesex, Essex, and Cornwall. It cannot be considered a common species.

Family XIII. **CAPSIDAE** (Miridae, Continental and American usage)

For the Palaearctic Fauna this family has been splendidly worked out by the late Professor Reuter in his magnificent work, "Hemiptera Gymnocerata Europae," an undertaking which, unfortunately for entomological science, was not completed before the sad affliction of blindness fell upon the author ; though planned originally to cover the whole of the gymnoceratous species, it did not quite complete even this one family of the *Capsidae*, and his views with regard to the few *Capsidae* left undescribed have to be sought elsewhere, scattered in numerous *separata*. But while an accurate and fairly extensive knowledge has been obtained of the Palaearctic species of this family, and the work of Van Duzee has done much for North American species, so far as the rest of the world is concerned, the information to hand is most incomplete. In consequence of the delicacy and fragility of these insects, and the difficulty of preserving them in anything approaching a perfect condition, collectors of exotic insects usually leave them severely alone. A notable exception to this general statement is the exquisite series collected by Mr. Champion in Central America for the "Biologia centrali-Americana." On the whole, however, it is impossible at present to form any conception as to the extent of this family, and one can only say that, so far as the Palaearctic Fauna is concerned, they number nearly half as many species as all the other families of the Gymnocerata put together, considerably more than 1000 having been catalogued, while for the British Fauna, they are proportionately still more numerous, being about 60 per cent of all the rest or about $\frac{3}{8}$ of the whole Fauna. And it is not only in the number of species that this preponderance is shown; in individuals they far surpass all other Heteroptera, so that in a promiscuous collection from any district the majority are sure to be *Capsidae.* Many of them are amongst the commonest of all insects, and hundreds of thousands, if not millions, of specimens must be produced every season in the British Isles alone.

As regards habits there is great diversity. The majority, no doubt, are strictly vegetarian in diet, sucking the juices of plants, and many are attached to special plants, apart from which they are scarcely ever found, showing as much fastidiousness or partiality in diet as do certain lepidopterous larvae. But some species are carnivorous, at least on occasion, if not regularly so, feeding upon the juices of Aphides, and sometimes of other Heteroptera. *Capsus ruber*, for example, is a well-known enemy of Aphides, and I have reared it by feeding it exclusively on the black aphis that infests the broad bean. Jennings (7) records a specimen of *Adelphocoris lineolatus* as sucking dry a specimen of the Homopteron, *Euacanthus interruptus*.

Reuter (1) says: "On the life and food of Capsids, close examinations are still wanting. Burmeister, Amyot and Serville, and Sahlberg, however, state that their food consists principally of small insects, and Kaltenbach notes that, concealed in the fissure of the bark, *Phytocoris tiliae* will lie in wait for small larvae and leaf-lice. I myself once brought home a nymph of *Leptopterna ferrugata* in a glass tube, in which, also, another little Hemipteron was enclosed; the following morning I found the latter sucked dry. Further, I once observed a *Plagiognathus pulicarius* on the look-out for small Podurids. Thus, it is settled that, at least, some kinds of Capsids live on animal juices. The relation of ant-like Capsids to ants is still unaccounted for, but their mimicry, or at least that of *Systellonotus*, seems to indicate that they live on animal food. The residence of an animal in the colonies of ants can scarcely be explained, if we suppose it to live on vegetable juices." According to Douglas (1), "*Systellonotus* probably feeds on the larvae or pupae of ants or on the food they bring home." Breddin (1) says, concerning the myrmecoid Capsids: "At any rate, an imitation of this kind would suggest that the Hemipteron and the ant live together, and this will scarcely be comprehensible unless we assume that certain members of a pronounced phytophagous Hemipteral family have entirely altered their mode of life, so as to be able to hunt for animal food after the same manner as the ants. Indeed, the vine on which I have yearly observed *Pilophorus clavatus* is closely covered with *Coccus*, and *Pilophorus cinnamopterus* Kbm. and *P. confusus* Kbm., according to the observations of Puton and Reuter, which I am able to confirm, will occur particularly on such plants as are closely covered with Aphids. *Myrmecoris*, however, which has repeatedly been observed in, or near, ant colonies, may, perhaps, feed on dead ants." Reuter (16) gives the following direct observations on Capsids living on vegetable food. "In my paper 'On the Study of Mimetic *Hemiptera* and the

History of their Way of Living' (5), appears the following: 'It may be mentioned, here, that some of the Capsids known to be vegetable suckers, feed, however, on animal juices also. Thus, Professor Stål informed me that he was once stung by a *Phylus melanocephalus*, and that the sting felt almost like that of a gnat. In the Zoological Gardens of Berlin I had an opportunity, in June, 1876, of seeing several nymphs of *Psallus variabilis*, *P. varians*, and *P. diminutus* sucking a butterfly larva.' Concerning *Calocoris fulvomaculatus*, I have recorded (9) that I likewise once found several nymphs of this species sucking a dead larva of a butterfly. In the same work (p. 193) there are some remarks on the habits of *Macrotylus quadrilineatus*: 'According to the observations of Prof. Mayr, this species lives on small insects, flies, and gnats, which stick to *Salvia glutinosa*, where the *Macrotylus* awaits them, sitting quite still. Probably, several Capsids, dwelling on viscid plants, live principally on animal food.' These Capsids (*Macrotylus*, *Dicyphus*) are distinguished by their very short claws, which may enable them to rest on viscous plants without sticking to them." These notes will suffice to show the need for further observations on the food of these insects.

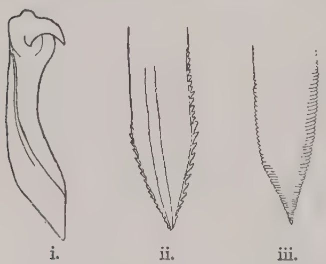
The majority of the *Capsidae* are found on low plants, but many species inhabit trees. A very few, and chiefly myrmecophilous species, are to be met with running upon the ground. None inhabit the water, although many are found in damp and swampy places. None, again, are regularly subcortical in habits, though hibernating specimens of certain species occur under bark in winter. Some species, as already mentioned, are myrmecophilous, and exhibit more or less resemblance to ants, but the exact nature of the association is yet little more than conjectural.

The majority exist in the larval condition during the late spring and early summer, and mature in July or August. Their life as imagines is usually not a long one and extends over the summer months only, but some few species hibernate as imagines, depositing their eggs in the following spring. The majority, however, would appear to oviposit in the autumn and so to pass the winter in the egg condition. Some of those species that hibernate as adults manifest a curious kind of seasonal dimorphism, the exact explanation of which is not yet fully determined. It consists apparently in such a change of colour in the hibernating specimens as puts them in harmony with their environment when they reappear in the open in spring; this applies specially to those species that live amongst grasses; such examples are ochreous in the autumn when the grasses have passed their prime, have become dry and have assumed an ochreous tint, while the over-wintered specimens met with in the spring, when the grass is fresh and green, are also of a green colour.

Sexual pterygo-dimorphism exists in a good many cases, when the

♂♂ are macropterous and the ♀♀ brachypterous (e.g. *Leptopterna*), occasional specimens only of the latter appearing in macropterous form. But the proportion of these fully developed ♀♀ varies considerably in different species; in some instances examples are not uncommon and are met with in most seasons, while in others (e.g. *Mecomma*, *Globiceps dispar*) the occurrence of a macropterous ♀ is a matter of extreme rarity. There are other species in which both sexes are normally brachypterous (e.g. *Bryocoris*) though fully winged examples occur, but locally and rarely. In species which have only the ♂ macropterous, that sex is usually much less abundant than the ♀, and macroptery is clearly an advantage, enabling the insect to visit distant colonies in search of partners. In such cases it can scarcely be doubted that the insect is polygynous.

All the members of this family are furnished in the ♀ with an ovipositor in the form of a scimitar which is articulated to the body anteriorly and free posteriorly; it contains four saws which appear to work very much as those of saw-flies amongst Hymenoptera; when at rest they are closely pressed together and kept in position between two triangular plates. The strength and curvature of the ovipositor varies in different species. It may be assumed, from the presence of this apparatus, that the eggs are laid in incisions made beneath the cuticle of the food- or host-plant.



i. Saw-case of *Pycnopterna striata* L.
ii. Saw of *Lygus pastinacae* Fall.
iii. Saw of *Orthotylus marginalis* Reut.

The curious malformation known as oligomery of the antennae, which is so common amongst the *Lygaeidae* does not appear to occur at all in the *Capsidae*, although the slenderness and delicacy of the antennae frequently lead to their being imperfect in the adult condition, but this imperfection never finds its balance in a fusion of the remaining joints.

The integument of the larvae is so weak, and their colours are so fleeting, that the preservation of specimens of the early stages becomes a difficult matter; when dried they often shrivel up so as to lose much of their original shape, and become more or less uniformly blackish-brown in colour, grotesque caricatures of their natural appearance. Preservation in spirit, while retaining the shape, is hardly more effective than drying for saving the coloration, but formalin succeeds better. Reuter (2) has given brief descriptions of many larvae, which will be included in the following pages.

These insects are sometimes subject to the attacks of parasites, apparently of either a dipterous or hymenopterous nature. No doubt the weakness of the larval integument renders them peculiarly liable to such attacks. A ♂ specimen of *Dicyphus pallidicornis* which I took in the summer of 1915, showed a greatly distended abdomen, so that in the net I thought it was a pregnant ♀; accordingly I enclosed it in a tube in the hope of securing eggs; but finding on closer examination that it was a ♂ I kept it alive awaiting developments. In a few days it voided a large apodous cream-coloured larva, which when I saw it first was larger than the body of its host; it was wriggling about, apparently in discomfort, and was evidently greatly distended with fluid. Soon after, it voided this fluid, almost swamping the *Dicyphus* in the discharge, became greatly reduced in size and soon shrivelled up and died. The *Dicyphus*, freed from its encumbrance lived a few days longer but then died. I once had a similar larva voided by a larva of *Calocoris fulvomaculatus*, after the latter had been killed and gummed on a card, and again a similar one from the larva of an earwig. In the case of the *Dicyphus*, possibly the artificial conditions of its captivity reduced its vitality so much that the parasite was unable to complete its transformation, and therefore of course its specific identity could not be determined.

Although the *Capsidae* are attached to vegetation, and are very prolific, often existing in countless numbers, they have not hitherto in this country, except in a few instances, been charged with destructiveness to agriculture. No doubt this is largely because their food-plants consist chiefly of what are denominated "weeds"; but even when they attack forest trees they do not appear to produce any appreciable effect upon the well-being of the trees. Where, however, they attack fruit trees, the result may be different. Two species of *Capsidae*, *Plesiocoris rugicollis*, and *Orthotylus marginalis*, have acquired the habit of attacking apple trees (J. C. F. Fryer), and great damage is being done by them to orchards in some parts of England, by their piercing the young and fruit-producing twigs, if not actually the rudimentary fruits themselves, thus causing the young shoots and the buds to shrivel up, and so ruining the chances of a crop or at least disfiguring the fruit and rendering it unsaleable.

The eggs are minute and are inserted beneath the bark, so that not only is their detection far from easy, but effective remedies are very difficult of application, and the best plan is probably to rely upon natural agencies, such as birds, other insects, etc. The descriptions which I have given in the following pages of the eggs in this family have in almost all cases been taken from the ovarian eggs, removed from the body of the ♀; these, however, were generally fully formed and apparently ready to be laid. Several species, such as *Calocoris norvegicus* (bipunctatus), *Lygus pabulinus* and *pratensis*, and certain *Orthotyli*, make themselves quite at home in ordinary gardens, attacking the various vegetables and fruits, but I have not noticed that they produce any serious results except in the case of potatoes. *Capsus ruber* is also an inhabitant of gardens, but its rôle is probably a useful one, that of reducing the number of Aphides.

In such an extensive family as the *Capsidae* (the British species alone numbering 178) some useful system of classification into sub-families is a great desideratum. Prof. Reuter (12) made several attempts at such a system. In his "Hemiptera Gymnocerata Europae" sixteen divisions are enumerated, only ten of which are represented in our fauna. This arrangement is considerably modified in his "Neue Beiträge zur Phylogenie und Systematik der Miriden" (21), published in 1910. In this work the family *Capsidae*, or *Miridae*, as Reuter there calls it, is sub-divided into nine sub-families, six of which are represented in the British Fauna. These are the *Mirina*, *Bothynotina*, *Bryocorina*, *Macrolophina*, *Heterotomina*, and *Phylina*. The bulk of our species fall into the first and the last three sub-families, for the *Bothynotina* and the *Bryocorina* contain only three species between them.

The *Mirina* are sub-divided into five divisions, only three of which, the *Miraria*, *Restheniaria*, and *Capsaria*, are represented with us; the *Bothynotina* into two divisions, one of which, the *Bothynotaria*, occurs in Britain; the *Bryocorina* are undivided; the *Macrolophina* contain three divisions, two of which, the *Cremnocephalaria* and the *Macrolopharia*, have British representatives; the *Heterotomina* contain two divisions, the *Halticaria* and the *Heterotomaria*, both appearing on our list; and the *Phylina* contain two divisions, of which only one, the *Phylaria*, has representatives in the British Isles. The characteristics of these sub-divisions are to be sought mainly in the shape of the body, the presence or absence of an apical ring to the prothorax, the form and size of the legs, the presence or absence of a "hamus" or hook-like nerve in the wing-cell, the nature of the arolia (the pads appended to the claws), the relative size of the third joint of the tarsi, the vestiture, and the shape and relative proportions of the different parts of the head.

The following tables may serve as a key to the above classification, so far as our British species are concerned, though the characters mentioned would not be sufficient for students who wish to take a wider purview. It will be observed that Reuter makes great use of the arolia in this scheme. These are difficult to see and require, as a rule, the use of the compound microscope; the English method of carding and carefully setting specimens renders them still more difficult of examination, as the arolia become disfigured by the gum. These disadvantages undoubtedly militate against the practical utility of the scheme to an Englishman, but they can be largely neutralised if the specimens are examined when in a perfectly fresh condition and before setting.

Van Duzee, dealing with American species of this large family, has slightly modified Reuter's classification, calling the Heterotomina Orthotylini, and dividing up the Mirina and Macrolophina, the former into three sub-families corresponding to Reuter's divisions, and similarly with the latter.

Table of sub-families of CAPSIDAE (MIRIDAE).

(2) 1. Arolia large, free, approximating at base between claws, plainly separated towards apex, and at apex generally somewhat dilated; species large or of moderate size, chiefly 6–12 mm. **Mirina.**
(1) 2. Arolia otherwise or absent; species rarely more than 5 mm. in length.
(4) 3. Membrane distinctly pilose; no arolia . . **Bothynotina.**
(3) 4. Membrane glabrous.
(6) 5. Last joint of tarsi slightly incrassated towards apex; membrane one-celled; claws widely diverging, arolia distinct; tibiae without spines; species small . . . **Bryocorina.**
(5) 6. Last joint of tarsi not incrassated; tibiae generally distinctly spined.
(8) 7. Prothorax with apical ring . . . . **Macrolophina.**
(7) 8. Prothorax without apical ring.
(10) 9. Arolia free, slender, parallel or approximating at apex; wing-cell without a hamus . . . . . **Heterotomina.**
(9) 10. Arolia united with claws; wing-cell with a hamus. **Phylina.**

In order to adapt the following descriptions to the above scheme it will be necessary somewhat to modify the order in which the *Capsidae* are arranged both in Saunders' " Hemiptera-Heteroptera of the British Islands " and in the latest British Catalogue (1908).

Sub-family I. **Mirina.**

This sub-family contains twenty-two of our British genera as catalogued in the latest issue, and includes almost all the largest and most conspicuous species, amounting to about two-fifths of the whole. The group contains upwards of three hundred already described Palaearctic species, of which we possess sixty-eight. The most difficult genera no doubt are *Phytocoris* and *Lygus*, and this not only as regards the imagines but the larvae as well.

Table of Divisions of the Mirina.

(2) 1. Prothorax without apical ring; vertex with longitudinal sulcation or transverse impression . . . . *MIRARIA.*
(1) 2. Prothorax with apical ring.
(4) 3. Pronotum margined anteriorly; colours black and orange or yellow, not shiny . . . . *RESTHENIARIA.*
(3) 4. Pronotum not margined anteriorly, or if so colours not as above . . . . . . *CAPSARIA.*

Division *a.* *MIRARIA.*

This division contains five genera with thirteen species as tabulated in the British Catalogue, but, if our nomenclature is conformed to the continental, these five genera will become eight. They are all elongate insects, generally inhabiting grassy places, a few only being found amongst *Scirpi* or Rushes in salt marshes. None are associated except accidentally with trees. They form a very natural group, and some of them, at least, hibernate as perfect insects. Most of them harmonise wonderfully with their environment. We possess nearly half of the Palaearctic species, as enumerated in Puton's Catalogue.

Analytical Table of the *MIRARIA.*

(10)	1.	Head channelled down the middle.		
(5)	2.	Base of pronotum truncate, covering base of punctured scutellum.		
(4)	3.	Posterior femora spined.	1. *Brachytropis*	Miris Br. Cat.
(3)	4.	Posterior femora unarmed.	2. *Stenodema*	
(2)	5.	Base of pronotum emarginate, not covering base of impunctate scutellum.		
(7)	6.	Tibiae with long hairs, no spines.	3. *Notostira*	Megaloceraea Br. Cat.
(6)	7.	Tibiae with short hairs, fine spines.		
(9)	8.	Antennae longer than the body.	4. *Megaloceraea*	
(8)	9.	Antennae as long as body.	5. *Trigonotylus*	
(1)	10.	Head not channelled but transversely impressed.		
(12)	11.	Eyes not, or scarcely, projecting beyond lateral margins of pronotum.	6. *Acetropis.*	
(11)	12.	Eyes prominent, projecting considerably beyond lateral margins of pronotum.		
(14)	13.	Depressed, glabrous above, or nearly so.	7. *Teratocoris.*	
(13)	14.	Not depressed, clothed with erect hairs.	8. *Leptopterna* (Miris, Reut.)	

252. **Miris calcaratus** Fall. (Stenodema id. subg. Brachytropis Reut. and Osh. Cat.).

Fall. Hem. Suec., i, 131, 5 (1829); D. & S., B.H. 286 (1865); Saund., H.H.B.I. 222 (1892).

Ova. Undescribed, but see next species.

Larvae. "Nympha imagini statura sat similis, vitta laterali utrinque sanguinea, rudimentis alarum elongatis" (Reuter).

This very brief diagnosis may be supplemented as follows: In the last two instars, 3¾ mm. and 4¼ mm., this species may easily be distinguished by the spines on the hind femora, of which there is one only in each case, short and blunt in the smaller, longer and sharper in the larger. The coloration in both cases is the same. It is darker than in the other Miraria except *Leptopterna*, smoky-brown at sides, yellowish in middle, abdomen dull green, with a sanguineous stripe just within the connexivum on each side, the connexivum pale yellowish-green; the red stripe is perfectly definite outwardly, but shades off inwardly into the green; wing-pads long in the last instar, extending more than half-way down the abdomen, smoky-brown, with yellowish outer margins; in the penultimate instar they are much smaller, scarcely trenching on the abdomen at all; this smaller one also has a central yellow line to the abdomen; legs and antennae in both instars smoky, tarsi darker; legs and sides of body set with minute, rather stout, black hairs; basal joint of antennae short and stout; second joint long, third and fourth each shorter than the preceding.

Life-cycle. The imago has been found from February to October, but with this difference, that those taken from February to June or the beginning of July are of a green colour, while those that occur from the end of July to October are more or less ochreous or brown and never green. Occasionally a few stragglers of the green specimens live on to the beginning of August. The eggs are laid at the end of May or the beginning of June, and the insects of the year are hatched in June, and mature from the end of July to the middle of August. These are all ochreous or brown examples, while their parents, or at least their mothers, are green. The autumn examples apparently retire into hibernation at the beginning of November and remain in hiding till the following spring; but as the specimens that then appear are green, one is forced to the conclusion that they change their colour during their retirement. No larvae are ever met with during the winter months, and therefore these green spring insects cannot be a second brood, and the conclusion seems inevitable that they are the same individuals as in the autumn wore an ochreous or brown dress. In support of this conclusion I may mention that I have a spring specimen taken in the middle of June, which had only partly assumed the green tint, part of the pronotum, the left elytron, and part of the abdomen being green, while the rest of the insect still remained of the original ochreous colour. Another taken in May had both hemielytra more or less green, while all the rest was ochreous, and I have seen other specimens with varying admixture of the two colours. If we may judge from the next species, the eggs would be laid in late spring or early summer, and the insects mature in July and August, retiring into hiding in November and reappearing in the open in the following April and May. Specimens found in the earlier months of the year occur at the roots of grass or under other kinds of shelter. According to my own experience all the vivid green specimens are ♀♀, and this points to the conclusion that only the ♀♀ hibernate, and that fecundation takes place in the autumn, although the eggs are not laid till the following spring. I have, however, two ♂♂ taken in August, which are of a rather darker colour than usual, and are also tinged with green. Meyer Dur says it is one of the earliest species of the genus, and this coincides with my experience.

Habitat, etc. This species is found by sweeping long grasses; Dalla Torre records it from the flowers of Umbelliferae, and Morley took it in the New Forest in a marsh. J. E. Mason (1) found it less plentiful near the sea in Lincolnshire than inland. Buchanan White, speaking of its occurrence in Scotland, says: "Among grass on dry banks throughout the whole year probably specimens may be found." Lucas exhibited at a meeting of the Entomological Society of London, February 4th, 1903, specimens of this insect and seeds of a grass swept up together by Mr. Ashdown on the canal side near Byfleet on July 12th, 1902. The similarity of form and colouring constituted a possible case of protective resemblance. It has been found as prey in the nest of the spider *Theridium sisyphium* (Verhoeff, 2).

It is extremely variable in colour. As above mentioned, there are the two typical seasonal forms, green and ochreous, but the latter give rise to endless varieties in which there is more or less streaking with brown or even pitchy, and sometimes a reddish tinge, especially in the antennae. There is also considerable variation in size, especially amongst the ♂♂, some of which are very small, not exceeding 5½ mm. in length. Reuter describes three varieties, *virescens* the green form, *pallescens* the ochreous one, and *grisescens* Fieb., the darker one. A very closely allied species is found in N. America, as well as in the eastern half of Palaearctica.

Distribution. *M. calcaratus* extends throughout the whole of Europe except the extreme north, and passes also into Northern and Central Asia, where it extends almost to the eastern coast; its southernmost Asiatic limit is Afghanistan. In Switzerland it occurs up to an altitude of 4000 feet (Meyer). It is said to occur in the Ethiopian region also. In Britain it is generally distributed, being included in almost all lists that make any pretensions to completeness (thirty-two English counties and three Welsh ones). I have no records for the eight English counties of Salop, Staffs, Derby, Rutland, Hunts, Beds, Northants, and Monmouth. The Welsh records are from Carnarvon, Glamorgan, and Carmarthen. Buchanan White says of it: "A tolerably common and widely distributed species in Scotland." Halbert has also recorded it from Ireland. J. E. Mason records it from the Isle of Man, and it is included in Morey's List for the Isle of Wight.

253. **Miris laevigatus** L. (Stenodema id. Reut. & Osh. Cat.).

Lin., S.N. 730, 101 (1767); D. & S., B.H. 284 (1865); Saund., H.H.B.I. 221 (1892).

Ova. An egg laid in captivity is 1¼ mm. long, cylindrical, truncated at the distal extremity, and at the proximal end partly imbedded in a longitudinal slit in a blade of grass. Its colour is creamy-white, and its surface smooth and shining. The summit gradually assumes the form of a sort of cap, which is constricted from side to side. Hatching takes place by the thrusting up of this cap, which, after the disclosure of the larva, falls back into place again, so that the egg when hatched looks very little different from what it did before, save for its obvious emptiness. Just before hatching two dark stains appear, and the empty shell is milk-white with the cap hyaline (Butler, 27).

Larvae. 1st instar. Body almost cylindrical, slightly swollen at the head and tapering to end of abdomen; antennae long, much longer than the body; colour pale yellowish-green, with eyes red and antennae red at apex; head rounded in front, broader than the rest of the body, and with a furrow down middle of vertex, specially strongly marked behind; the three thoracic segments dorsally similar to one another, the pronotum being the largest; head and thorax yellowish, and abdomen greenish with a distinct yellow spot on dorsal surface of second abdominal segment; antennae four-jointed, apical joint stouter than the rest; legs comparatively stout and slightly dusky; this duskiness lies in the epidermis, the true colour being beneath; tarsi two-jointed, with basal joint very small and apical large; claws also large; rostrum long and four-jointed. During the course of this instar the head becomes ochreous and the body green.

2nd instar. Length of larva now 2 mm. Traces of the connexivum now appear. Head ochreous and rest of body green; a dark streak runs the whole length of the body on each side, reddish-brown as far as hinder part of thorax, and yellowish the rest of the way; dorsal yellow spot on second abdominal segment still visible; abdomen now broader than thorax, and terminal joint of antennae not so thick as before; legs yellow with a smoky shade; sulcature of head less distinct; a white line runs down the middle of back, but this appears to represent an underlying structure rather than pigment in the skin, and is possibly the dorsal (circulatory) vessel.

3rd instar. Length 3½ mm. A distinct pale and foliaceous margin appears down each side of the body, foreshadowing more distinctly the connexivum, but appearing on thorax as well as abdomen, though widest on the latter; inside this a dark streak down each side; no trace of wing-pads appearing as yet; legs pale, but with rather smoky skin; the antennae have now assumed their final proportions, terminal joint being thinnest and basal thickest; colours of body now more opaque than hitherto.

4th instar. Length 4½ mm. In this instar the beginnings of the wing-pads distinctly appear.

5th instar. Length 7 mm. Wing-pads much elongated, covering three abdominal segments; a thin red stripe replaces the dark stripe down each side of the body; yellow spot at base of abdomen very distinct, and connexivum clearly marked off; a dark spot appears in the abdomen.

In the imago the body is green and the hemielytra ochreous at first disclosure, but soon afterwards it becomes altogether ochreous.

Life-cycle. I found a green ♀ of this species in Epping Forest on May 28th, 1910. As it appeared to be gravid, I brought it home alive, hoping to secure eggs. The first and only egg was laid June 8th. This is the egg described above, and it yielded the five larval instars of which I have already given descriptions. It hatched on June 22nd; the first ecdysis of the larva took place on June 26th, the second on July 1st, the third on July 7th, the fourth on July 14th, and the fifth on July 23rd. This yielded an ochreous ♂. This particular individual, therefore, took forty-five days for its complete development, distributed as follows: egg fourteen days, first larval instar four days, second instar five days, third instar six days, fourth instar seven days, fifth instar nine days. Thus nearly a third part of its pre-adult existence was spent in the egg state, while the duration of the larval instars gradually increased from four days to more than double that amount. Here we have, then, an ochreous ♂ the offspring of a green ♀ maturing in the last week in July; the majority, however, do not complete their changes till the middle or end of August, when both sexes appear. The imago has been taken from February till October. Thus, as with the previous species, the insect hibernates as imago. The insects of the year, both ♂♂ and ♀♀, produced in August are ochreous, and as the spring specimens are, to judge from my collection, all ♀♀, it would appear that impregnation must occur in the autumn, although, if the above history of my specimen in captivity was normal, the eggs are not laid till the following spring. Moreover, as all the spring specimens are green, it follows again, as with the preceding species, that this change of colour must take place while the insect is in hibernation, since they cannot be a distinct brood, as no larvae are ever seen except in the summer. The above is the usual course; I have, however, taken the ♂ in February, though only an occasional specimen, and hence a spring fecundation is not an impossibility (Butler, 27).

Habitat, etc. Like the preceding species, this insect is taken by sweeping in grassy places, and it subsists on these grasses, whose juices it sucks. The green ♀ referred to above was inclosed in a glass tube and supplied with grass blades and stems, chiefly *Poa annua*. It frequently fed upon them, inserting the cibarial setae some distance into the tissues of the grass, so that the labial trough was bent at the junction of the first and second joints into an angle away from the setae, while its apical part guided them as they were pushed forward. The rostrum is too long to be placed at right angles to the body when in use, and slopes backwards underneath the body; hence the insect can have but a very imperfect view of the point of attack. But perhaps this is not so much of a drawback as might be imagined, since the apex of the rostrum is furnished with tactile hairs, which are no doubt useful in taking the bearings of the point of attack. When the young larva is in its first instar, its rostrum, in feeding, is bent into two angles, one at the junction of the first and second joints, and the other at the junction of the third and fourth, so that it is guided by the labial trough at two points only, the junction of the second and third joints, and the apex. The antennae are frequently waved up and down, the two sides being moved alternately. The excrement consists of a single drop of a dark yellow liquid. The insect in its earliest stages is exceedingly agile and energetic in its movements. The larva frequently cleans its antennae by passing them between its fore tarsi, which are then rubbed together after the fashion of *Musca domestica* (Butler, 27).

It commonly occurs by sweeping the coarse herbage that grows at the side of woods. J. E. Mason (1) records a specimen from the sandhills in Lincolnshire, but finds the species less common near the coast than inland. Buchanan White says: "It frequents grasses and low plants, but seems to prefer more open situations than *M. holsatus*." I once beat a specimen from Scotch fir at Burnham Beeches on May 8th, but this cannot have been more than a chance association, unless indeed the insect had taken up its winter quarters in the fir tree, as do so many other Hemiptera, and was still occupying them.

In coloration it is almost as variable as the preceding; in fact Reuter enumerates four varieties, *virescens* Fall., the green one; *pallescens* Fall., the pale ochreous one; *grisescens* Fall., the darker ochreous one; and *melas* Reut, an almost wholly black one. The first three forms are common with us, but the last is decidedly rare, only three specimens having come to my knowledge. One of these was taken by Mr. Jennings (5) at Bickley, Kent, on August 25th, 1901. He describes the specimen thus: "It has the head, thorax, and scutellum, the elytra down to the base of the membrane, the two lower joints of the antennae, together with the legs, dull black, while the apical portions of the elytra, and the third and fourth joints of the antennae, are brownish, the membrane smoky brown." Another was taken by Mr. Bedwell, at Chipstead, Surrey, August 26th, 1911, and the third by myself at Northwood, Middlesex, August 21st, 1916.

I have twice tried to keep specimens in natural surroundings through the winter, hoping thus to prove that the ochreous specimens change to green ones during that time, but unfortunately, through unforeseen and unavoidable circumstances, the experiment fell through on each occasion.

The genus *Stenodema* has many species, which are closely allied, and attention should be paid to minute points of structure, such as the thickness of the basal antennal joint, its clothing of hairs, the hairs on the legs, the little bend just below the knee in the posterior tibiae, etc.

Distribution. This insect extends throughout the whole of Europe except the extreme north ; it occupies also Algeria, Asia Minor, and Chinese Tartary. In Britain, it is very generally distributed, being included in the majority of the published lists (twenty-nine English counties and four Welsh ones). I have no records for the following eleven English counties : Northumberland, Durham, Salop, Staffs, Derby, Rutland, Hunts, Beds, Northants, Worcester, and Monmouth ; the Welsh records are from Carnarvon, Radnor, Carmarthen, and Glamorgan. With regard to Scotland, Dr. Buchanan White says : " This is not such a common species as *M. holsatus* ; I have taken it in Perthshire and Kirkcudbrightshire." Similarly, in N.E. Yorks I have found it quite rare, while *M. holsatus* is in abundance. Halbert records it from Ireland, and J. E. Mason (7) from the Isle of Man. This, again, has a closely allied companion species, and both of them occur also in N. America. There seems no reason why this companion species, *S. virens*, should not occur with us.

254. **Miris holsatus** F. (Stenodema id. Reut. & Osh. Cat.).

Fab., S.R. 254, 4 (1803) ; D. & S., B.H. 283 (1865) ; Saund., H.H.B.I. 221 (1892).

Ova. Undescribed, but see *M. laevigatus*.

Larvae. Two instars, probably third and fourth ; length 2¾ mm. and 3¾ mm. Greenish ochreous with a broad dark fuscous stripe on each side of thorax. Antennae and legs greenish, more or less obscured by the smoky skin, especially the antennae ; tarsi black. Rudimentary wing-pads appear in the larger instar, but they are quite small. In the later instar the body is shorter and broader than in the allied species, and by this it can easily be distinguished from *M. laevigatus* ; also the first and second joints of the antennae are shorter than in that species ; it is also less variegated in colour, and the red line is absent. Of course, the absence of the tooth on posterior femora will separate it from *B. calcaratus*.

Last instar (probably fifth), 4¾–5¼ mm. As above, but with the fuscous streak more marked, and extending down inner half of wing-pads ; outer margins of wing-pads and pronotum clear ochreous ; hairs on antennae longer, and wing-pads extend about ⅓ of the way down abdomen.

Life-cycle. The imago occurs from April to October ; I have also a record for December, showing that some specimens at least hibernate as imago. The insects of the year mature in August, and may be met with during that and the next two months, appearing again in the spring, though in greatly reduced numbers. The life-cycle is, therefore, probably similar to that of the last two species, though, as the spring specimens are not very numerous, oviposition may also take place in autumn. Buchanan White says : " In early spring hibernated specimens are not infrequent ; in June larvae are common, and imagos still not scarce; in July, August, September, and October, imagos abound."

Habitat, etc. This species usually prefers damper places than suit the two preceding insects. It is often abundant in the shade of woods, where it may be obtained by sweeping long grasses and also *Pteris aquilina.* In some places, as e.g. the north-east of Yorkshire and Scotland, it seems to take the place of the two preceding species, being the dominant form, occurring everywhere, not only in shady and damp places, but also in more exposed parts, such as grassy roadsides, while the other two species are quite scarce. It occasionally shows more or less of a green tint, but the green forms are not nearly so common as in its allies, and occur chiefly in the more northern localities. On this point Buchanan White has the following observation: "The spring and early autumn specimens are frequently green, but in August, when the grass among which the species occurs is becoming yellowish, the majority of specimens are ochreous. If, as is possible, the spring individuals are hibernated autumn ones, how is it that they change from green to ochreous? By the direct action of the food-plant? Be the cause what it may, we have here a good example of protective mimicry." In this note, the author has apparently reversed the true order, which must be a change from ochreous to green. Unlike the two preceding, this species exhibits a kind of dimorphism, characterised by the degree of development of the membrane. The ♀ is almost always brachypterous, having the membrane somewhat abbreviated and rounded, and extending only slightly beyond the apex of the cuneus; this is not accompanied by any diminution in the size of the wings, so that the degree of brachyptery is very trifling. Macropterous ♀♀ are rare; I have one specimen in a series of thirty-two. This has the outer margin of the membrane as long as the cuneus, and therefore extending for the greater part of that length beyond the abdomen. This specimen was taken at Ewhurst, Surrey, in August, 1889. Macropterous ♂♂ are, I believe, not so rare.

Reuter (17) records three varieties of this insect, *viridi-limbata*, the green one, *testacea*, the normal pale form, and *dorsalis*, which is more or less fuscous above, except the middle of the head, a central line on and the lateral margins of the pronotum, the outer half of the corium, and the cuneus, which are ochreous; *testacea* is the commonest form with us, at least in the south.

Distribution. This insect is found over the whole of Europe up to 69° N. lat., as well as in N.E. Siberia and Turkestan, and also in Algeria. In Britain, while it is distributed over a very wide area, it is, except perhaps in the north, not so common as the two preceding species. I have records from only twenty-three English counties, viz. Northumberland, Cumberland, Westmorland, Durham, Yorks, Lancs, Cheshire, Notts, Leicester, Hereford, Glo'ster, Oxon, Bucks, Surrey, Sussex, Berks, Hants, Dorset, Devon, Cornwall, Wilts, and Somerset, and a doubtful one from Lincs; from the Welsh counties of Carnarvon, Brecknock, Carmarthen, and Glamorgan; it occurs in both Scotland and Ireland, in some parts of both of which it is very common, and Reuter found it in the Orkney Is. In Edwards' list of the Hemiptera of Norfolk the name of this insect occurs, but later ("Tr. Norf. Nat. Sc.," 1894, p. 650) the author points out this is an error for *Acetropis gimmerthali*, and that *M. holsatus* does not occur in Norfolk. It will thus be seen that there is a curious absence of records for that large strip of country which runs from the Humber to the south coast of Kent, and extends inwards to the western borders of Lincs, Rutland, Northants, Beds, Herts, Middlesex, and Kent. As this district contains some of the most thoroughly worked counties, it is evident that this points to a real absence of the insect, at any rate from the coastal counties of the area, and not to the absence or inactivity of collectors. The explanation of this peculiarity can scarcely be sought in the geological features of the district, for many different formations, both secondary and tertiary, are represented in the area, which they cross diagonally, being continued into counties where the insect occurs commonly. Nor can the proximity of the North Sea, with the special climatic conditions it produces, be the efficient cause, seeing that the species occurs abundantly in N.E. Yorks and throughout Scotland and the Orkneys, which are equally exposed to the E. and N.E. blasts that sweep across the waters of that inhospitable sea.

Buchanan White says it abounds throughout Scotland up to at least 1200 feet above sea-level. In the Alps it reaches a height of 6000 feet (Meyer), and it is, therefore, apparently a hardy species.

255. **Megaloceraea erratica** L. (Notostira id. Reut. & Osh. Cat.).

Lin., S.N. ii, 731, 107 (1767); D. & S., B.H. 287 (1865); Saund., H.H.B.I. 223 (1892).

Ova. I have not seen the mature egg, but seventeen ovarian eggs which I took from the body of a ♀, which were probably almost ready for exclusion, were of a greenish colour and from 1 to 1½ mm. in length. They were narrow, cylindrical and slightly arcuate, truncate at one end with an emarginate outline in profile, and bluntly tapering at the other end. The former would probably be the end at which the embryo would escape.

Larvae. Last instar, 6¾–7¼ mm. Similar to that of *M. laevigatus*, but differing in the following particulars: forehead produced beyond clypeus which is nearly vertical, so that from above no part of the face can be seen, whereas in *M. laevigatus*, the three lobes of the face are visible from above, the vertex being truncated above them; pronotum a little longer and with its anterior angles right angles, instead of being rounded as in *M. laevigatus*, antennae longer, not only in the aggregate, but in each joint, and the hairs shorter, rather stouter, and more adpressed; those of legs similarly, and tarsi longer; in addition to the two lateral fuscous streaks, head also with a central one, and pronotum two, which are faintly prolonged on to scutellum; general colour duller and red line absent. Of course, the thoracic punctures, the presence or absence of which distinguishes the two genera in the adult condition, do not appear in the larva in either species.

Life-cycle. The larvae appear in July, August, and September, while the imago has been met with from March to October. Probably, therefore, the insect hibernates as imago. The insects of the year mature in August and September, being generally rather later than the genus *Miris*. There is also a similar dimorphism to what is found in *Miris*, viz. that of green and ochreous specimens, but with much greater divergence than in *Miris*. The autumn ♀♀ are ochreous, often with a pinkish tinge, while the spring ones are of a vivid green. But this is not the only difference; the green specimens might easily be taken for a different species, for not only is their colour different, but they are also different in size, the pink one being the smaller, 6½ mm., while the green one measures 7 mm., and the latter also has much longer antennae, nearly 9 mm., as compared with 7 mm. for the pink one, and longer legs. The green ♀♀ are found throughout the summer months, even until August, when the pink ones appear. But there is even a further peculiarity, for specimens are sometimes found with the form of the green variety, but something of the coloration of the pink one, only that in this case the colours are rather darker, and may even tend towards fuscous. Considering the difference in size between the spring and autumn forms, the explanation of the dimorphism can scarcely be what was suggested in the case of *Miris*, for though one can conceive of the possibility that an adult insect may change its colour, one cannot imagine that it will grow in retirement, so as to have become a larger insect by the time that it reappears in the spring. Reuter (22) inclines to the belief that these two forms represent two distinct species, and he points out that a settlement of the question lies in the direction of breeding from the eggs of the two types of ♀; if the progeny of each type of ♀ breed true and always produce the same type, there can be little doubt as to their specific distinctness, whereas, if eggs from the one type produce offspring of the other type (as I have shown does really take place in *Miris laevigatus*), one would be forced to the conclusion that, notwithstanding the structural as well as colour differences, the two forms are conspecific. There are not the same differences in the ♂♂ structurally these are all alike and they differ only in depth of coloration; further, no green appears about them.

Habitat, etc. This species also is found by sweeping in grassy places, and is in many districts extremely abundant. It occurs not only in dry spots, where perhaps it is commonest, but also even in salt marshes, where I have taken the green form. Morley took this form on *Artemisia maritima*. It is preyed upon by Fossores, and has been found as prey in the nest of the spider *Theridium sisyphium* (Verhoeff, 2).

The two forms referred to above are by Fieber called respectively var. *virescens* and var. *ochracea*. This applies chiefly to the ♀; the ♂ is much less variable; it is generally dark fuscous or black except for all the lateral margins, which, with a central line to pronotum and scutellum, are broadly ochreous. Occasionally, however, there are specimens of a more reddish ochreous tint, with four fuscous lines on the pronotum. Two other closely allied Palaearctic species, *N. caucasica* Kol. and *N. poppiusi* Reut., are known, and the late Prof. Reuter (22) very fully discusses the relation of these four forms to one another, reaching the conclusion that they probably represent four distinct though closely allied species. So far as our present forms are concerned, his conclusion is based upon the examination of 142 *virescens* and 169 *ochracea* females, which he obtained from all the chief Hemipterists of Europe, including our own country, so that as large an area as possible might be represented. The other two species are from S. Russia and Turkestan. He finds it difficult to believe that a mere seasonal dimorphism should produce forms which show such considerable structural differences, though mere colour differences are, of course, not infrequent. But, as already pointed out, he considers, and no doubt rightly, that the true test must be breeding from the egg. It is very desirable, therefore, that this experiment should be made. The possibility of its successful accomplishment is shown by my experience with *Miris laevigatus*, though it must be admitted that that experiment was of the nature of a series of lucky chances.

In Oshanin's "Katalog" (1912), *ochracea* Fieb. is given as a distinct species under the name of *tricostata* Costa. In that case we have the curious phenomenon of two species with entirely different ♀♀, but with identical ♂♂.

Distribution. This species is widely distributed on the Continent, and spreads into Algeria, Turkestan, Syria, and Asia Minor. In Britain also it is of pretty general occurrence. I have records from twenty-eight English counties, but none from the following twelve: Westmorland, Durham, Salop, Staffs, Derby, Rutland, Hunts, Beds, Warwick, Worcester, Hereford, and Monmouth; the Welsh records are from Carmarthen and Glamorgan. J. E. Mason records it from the Isle of Man. There are no records from either Scotland or Ireland. The British records do not distinguish *virescens* from *ochracea*, but it is desirable that this should be done.

256. **Megaloceraea linearis** Fuessl. (M. longicornis Fall.).

Fuessl. Verz. Schw. Ins., 26 (1775); D. & S., B.H. 289 (1865) (longicornis); Saund., H.H.B.I. 223 (1892) (longicornis).

Ova. Length 1¼ mm. Yellow, with alutaceous surface; very slightly curved, broadest about one-third from posterior end; truncate anteriorly, rounded posteriorly. These were taken from the body of a ♀.

Larvae. Similar to those of *M. erratica*, but with longer antennae.

Life-cycle. The imago has been found from July to September, and on the Continent in June. The insects of the year are mature by the beginning of August or shortly afterwards.

Habitat, etc. This species frequents grasses, on which it may be taken by sweeping. I have found it in roadside banks on *Brachypodium sylvaticum*, to the spikelets of which it bears so close a resemblance that its detection when it is at rest on the grass is difficult. E. Saunders found it on *Lolium perenne*. It has also been found on the flowers of Umbelliferae. In life this is a very elegant insect, but unfortunately its green colour is difficult to preserve, and the outlines of its form show too great a tendency to shrivelling. The green may remain for a year or two, but ultimately becomes a kind of dirty yellowish.

Distribution. This insect belongs chiefly to Central and Southern Europe, and occurs also in Algeria ; in the north it occurs but rarely. In Britain it is far more restricted in its distribution than the preceding species. The English counties from which it is recorded are the coast counties from Lincs to Sussex inclusive, together with Notts, Cambs, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Cornwall. The only Welsh record is from Glamorgan, and it is found in Scotland, but there are no Irish records.

257. **Megaloceraea ruficornis** Geoffr. in Fourc. (Trigonotylus id. Reut. & Osh. Cat.).

Geoffr. in Fourc. Ent. Par., 209 (1758) ; D. & S., B.H. 290 (1865) ; Saund., H.H.B.I. 224 (1892).

Ova. Length 1 mm. Yellowish, with surface alutaceous ; straight on one side, convexly curved on the other, anterior end obliquely truncate, much broader than the egg itself, and with the margin strongly emarginate, thus forming a strong rim ; rounded posteriorly.

Larvae. " Statura imaginis, virescens, glabra, striis mediis tribus dorsalibus percurrentibus albidotestaceis ; thorace lateribus obscurius virescente ; rudimentis alarum elongatis, apicem segmenti abdominis secundi attingentibus, testaceo-virescentibus, pallido-marginatis ; dorso abdominis puncto basali pulchre ochraceo ; antennarum colore in rubrum vergente " (Reuter, 2).

Life-cycle. The larva occurs in June and July, and the imago has been found from June to October. The insects of the year mature in August, and only a few specimens are found before this ; but whether such are overwintered examples or exceptionally early developments there is no evidence to show. Buchanan White, speaking of Scotland, says : " In the beginning of June larvae may be found among grass in the woods and along the edges of fields. At the end of June and thence to September the perfect insect is common." I have also seen larvae in August.

Habitat, etc. This is one of our most commonly occurring *Capsidae*, though it is rarely met with in great numbers. It is found by sweeping in grassy places, meadows, roadsides, etc. It is apparently not so gregarious as those species we have already considered, and often occurs in the net singly. It has not any ochreous form. It is preyed upon by Fossores.

In these grass-frequenting Miraria the saw of the ♀ is nearly straight, instead of scimitar-shaped, and rather broadened towards the point.

Distribution. It occurs throughout the Palaearctic Region to the north of Japan; it has also spread into both the Nearctic and Ethiopic Regions. In Britain it is one of the most widely distributed *Capsidae*, occurring in thirty English counties; I have no records for the following ten: Westmorland, Staffs, Salop, Rutland, Cambs, Hunts, Beds, Northants, Worcester, and Monmouth; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan. It is found in both Scotland and Ireland, and Reuter met with it in Orkney. Thus it is found all round the coast of England, and the deficiencies are mainly in the Midland counties. Buchanan White says that in Scotland it is found up to a height of 1200 feet.

258. **Megaloceraea psammaecolor** Reut. (Trigonotylus id. Osh. Cat.).

Reut. Berl. Ent. Zeit., 45 (1885).

This is the insect mentioned in Saunders' "Hem.-Het. Br. Is." as a pale var. of *M. ruficornis*. It is now, however, regarded as a distinct species, and there is abundant justification for this in the following structural differences: the head is longer, especially that part which lies between the antennae; the basal joint of the antennae is stouter and has longer hairs; the third antennal joint is shorter and the legs more hairy; add to this also that the colour is much paler.

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found in July and August.

Habitat, etc. This insect is confined to sandhills on the coast, where it occurs on the Marram grass (*Ammophila arenaria*). J. E. Mason (1) speaks of it as occurring on the flower spikes of *Elymus arenarius* as well as of the *Ammophila*.

Distribution. Very little is known about this. On the Continent it is recorded from Germany and Scandinavia. In Britain it has been recorded only from Cumberland (Murray), Lincs (J. E. Mason), Hants (H. R. P. Collett), Sussex and Carmarthen (Butler). No doubt it occurs in many other places, but has been overlooked.

259. **Acetropis gimmerthali** Flor.

Flor. Rhyn. Liv., 428, 5 (1860); D. & S., B.H. 291 (1865) (seticulosa); Saund., H.H.B.I. 220 (1892).

Ova. Unknown.

Larvae. Last instar, 4¼–4¾ mm. Elongate oval, proportionately broader and more rounded at sides than *Miris* or *Megaloceraea;* green, with a fine white streak down the middle, from behind the head to the end of the abdomen; a brownish streak down middle of head; this is continued in the pronotum and scutellum as two narrow streaks, one on each side of the central white streak; a broad, brownish band, continuous from front of pronotum to apex of wing-pads; margins of pronotum and wing-pads outside this, whitish ochraceous; legs and antennae infuscated ochraceous, becoming darker in the tarsi; antennae with second joint longer than third and fourth together; wing-pads long, rather less or rather more than half the length of abdomen.

Life-cycle. The imago is found from July to September, and on the Continent also in June. The larvae above described were taken June 19th, 1915.

Habitat, etc. This species is found in both dry and damp places by sweeping amongst grasses or at roots of rushes. Morley (4) gives an instance of its turning up unexpectedly and commonly in a wood in which it had been unknown for at least ten years. Superficially this insect bears, in the net, some resemblance to *Miris holsatus*, but the central longitudinal brown line should enable it to be recognised. The rounded form of the hemielytra in the ♀ is produced by a most peculiar shape and position of the cuneus, which is long, narrow, and curved in both inner and outer margins, so that the membrane is almost wholly on its inner side instead of stretching beyond it. The ♂ is longer and narrower, but still has the same curious conformation of cuneus.

Distribution. It is found throughout Central Europe and in Spain; in Britain it has occurred only in twelve English counties, viz. Derby, Norfolk, Suffolk, Bucks, Middlesex, Kent, Surrey, Sussex. Berks, Hants, Devon, and Somerset. This is another insect that has a sort of companion species which is more widely distributed.

260. **Teratocoris antennatus** Boh.

Boh. Öfr. V. Ak. Förh., 76 (1852); Saund., H.H.B.I. 225 (1892).

Ova. Length 1–1$\frac{1}{3}$ mm. Colour brownish-yellow; tubular, nearly straight for the greater part of its length, but rather abruptly bent near the anterior extremity; posteriorly rounded, anteriorly obliquely truncated.

Larvae. There are two forms of the larva, one green and the other very pale ochreous, with a red streak down the middle of the whole of the dorsal surface and two others at each side; margins of abdominal segments between these latter also red; legs and antennae very pale ochreous with a smoky tinge; apex of femora red; first joint of antenna slightly tinged with red, and apex of second joint similarly. In the green form the apices of posterior femora are slightly red, as also is basal joint of antennae and extreme base of second joint. These descriptions refer to two specimens I took at

Lymington in August, 1911, one (red) $2\frac{3}{4}$ mm. and the other (green) $3\frac{1}{4}$ mm. long, representing probably second and third instars.

Life-cycle. The imago has been found from June to October, but up till at least August, larvae of all ages may be found at the same time. Hence it is evident that egg-hatching takes place at intervals successively, and therefore probably oviposition as well.

Habitat, etc. This insect frequents damp places, where it may be found by sweeping, or by searching at the roots of *Scirpi*, rushes, etc., and according to Reuter, on the leaves of *Arundo phragmites;* this is confirmed by Morley (4). I have generally found it amongst *Scirpus maritimus* in salt marshes. The insects run about on the mud between the plants, and also climb the stems, keeping on the under side of those that slope. They appear to mount higher up the stems as it gets towards evening, and may, therefore, be more easily taken by sweeping between 5 and 6 o'clock p.m. I have taken one ♂ in a very dry place at the roots of marram grass (*Ammophila arenaria*) but this is exceptional.

Two schemes of coloration appear in the ♀, one green with a fuscous streak at the suture, and the other ochreous with black at the inner edge of the hemielytra; these no doubt correspond to the two types of larva above referred to. But of these two there are again endless varieties, some being wholly green or wholly ochreous, others with head, more or less of pronotum, and scutellum black. The coloration of the ♂ is much more uniform, the chief variation being in the proportion of orange and black on the hemielytra. Reuter mentions four varieties, indicated by letter only, and distinguished as above and by the proportion of black; but besides there are also, as mentioned above, the wholly green and wholly ochreous forms. The insect is, moreover, dimorphous, and according to Reuter, the macropterous form exists in the ♀ only. In this form the hemielytra exceed the abdomen by one-fourth its length. I have not seen any British example agreeing with this description, but the brachypterous specimens vary very much *inter se*, as regards the degree of elytral development; sometimes the hemielytra do not extend further than to about two-thirds of the abdomen, or again they may reach or even pass slightly beyond its apex. The wholly green specimens are at first sight difficult to separate from *T. saundersi;* but they have larger eyes and a narrower forehead, and besides are usually a smaller insect. They may, however, always be safely separated by the character of the basal joint of the antennae, which in *T. antennatus* is usually red and always has the hairs very short and more or less adpressed, so that sometimes it seems almost glabrous, while that of *T. saundersi* always has distinct and outstanding hairs and is usually more or less green in colour.

Distribution. This insect is recorded from Central Europe, but it is found also in Scandinavia and in Turkestan and Siberia. In Britain it has been found in ten English counties, viz. all the eight coast counties from Norfolk to Devon inclusive, and also from Cambs and Surrey. It is also recorded from Scotland, but not from Ireland.

261. **Teratocoris viridis** D. & S.

D. & S., E.M.M. iv, 46; Saund., H.H.B.I. 225 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. According to Buchanan White, it appears in the perfect state about the end of June and in July.

Habitat, etc. According to Reuter, it is found amongst *Carices*; Buchanan White says, "It frequents rough rushy ground, near lakes and rivers, and is probably not uncommon in such situations." Norman found it in moss. J. E. Mason (1) records a specimen from the Mumby sandhills, Lincs, off *Ononis arvensis*, July 25th, 1887. But of this specimen Saunders says, "I do not feel sure that this is not a ♀ *saundersi*. The two species are very closely allied in the ♀."

The species is dimorphous, and Reuter speaks of macropterous ♂ only, but of both sexes in the brachypterous form; Buchanan White, however, describes macropterous ♀♀ as well. In the macropterous ♂ the hemielytra surpass the abdomen by one-fourth of its length, and the membrane is large and iridescent; the wings are as long as the hemielytra (Reuter). This insect is closely allied to *T. saundersi*, and the colour differences are variable; the shortness of the basal antennal joint will help to distinguish it, but according to Reuter the most reliable character for distinguishing the two species is in the shape of the genital segment of the ♂; this, on the left side in *T. viridis*, is merely semi-circularly sinuate, while in *T. saundersi* there is in addition a strong tooth-like process just above the sinuation. A small var. of this species is the *T. hyperboreus* Sahlb.

Distribution. This species is but little known, being recorded only from Scandinavia, Russia, and Siberia outside the limits of the British Isles. It occurs as far north as 68° 40′. It was first taken near Loch Rannoch, and was described from a single ♂ in 1867. It has also been taken in Ross-shire and Aberdeenshire by Buchanan White, and in Dumfriesshire by Dr. Sharp; Marshall records it from the Isle of Skye, and Reuter from Forres and the Orkneys; Norman took it in Perthshire; White records it from a height of 1700 feet at Glen Callater, near Braemar; Haliday records it from Ireland, but it will be seen that with this exception and Mason's single doubtful record from Lincs all the localities are on Scottish ground.

262. **Teratocoris saundersi** D. & S.

D. & S., E.M.M. v, 260; Saund., H.H.B.I. 226 (1892).

Ova. Unknown.

Larvae. "Nympha: Tota virescens, tantum apice rostri et tarsorum nigris" (Reuter, 2). To this may be added that the last joint of the antennae and the eyes also are black; the basal joint has hairs but not long ones, as they are in the adult; pronotum transverse, emarginate in front and very slightly so behind, and with all the angles rounded; extreme margin of pronotum and wing-pads with a row of very small black setae.

Life-cycle. The imago is found from the end of June to September. I have, however, found the insect in all its stages in August, which implies that the hatchings do not synchronise, and therefore, probably, oviposition is effected at intervals as well.

Habitat, etc. It occurs in damp places amongst rushes and also, according to Reuter, on *Phragmites* and amongst *Eleocharis*. J. Sahlberg records it from *Rubus idaeus* and *Calamagrostis*. I found it at Whitstable amongst *Juncus compressus*. J. E. Mason (5) records it from the Mumby sandhills, but does not mention any plant. The ♂ is much less common and also much more active than the ♀. The species is dimorphous, and both macropterous and brachypterous forms exist in both sexes, the brachypterous ones being always by far the commoner. Saunders (19) took the macropterous ♀ at Deal, but I know of no British macropterous ♂. The insect must be searched for at the roots of the rushes, and there is little chance of obtaining the ♀♀ by sweeping.

This species is subject to a good deal of variation in size and in the length of the basal antennal joint and the legs. Through the kindness of various correspondents I have been able to examine a very long series, and I find that the smallest specimens (♀) are from Kent (4½ mm.–6 mm.), next from Suffolk (5½ mm.–6 mm.), then from Dorset, Hants, and Norfolk (5¾ mm.–6¼ mm.), and lastly from Devon and Notts. (6 mm.–6¾ mm.). The extreme limits for the ♀ therefore are 4½ mm. and 6¾ mm., an unusually large amount of variation for a Capsid. For the ♂ the range is not quite so great, being 4 mm. (Kent) to 5¾ mm. (Devon). Thus, as we travel north and west from Kent, the size of the insect increases. The increase in the length of the basal antennal joint is more than proportional to that of the insect itself, but takes place in the same topographical order (Butler, 42).

The genital armature of the ♂ of *T. saundersi* is of an extraordinary form, which, however, is of generic and not of specific significance. The left clasper consists of a long and stout appendage, which, starting on the left side, passes across the end of the abdomen beneath to the right side, and then makes a sudden and rather wide bend upwards; having thus risen above the dorsal surface, it passes diagonally forward across and above the genital segment in the form of a long and slightly curved claw. The right clasper is small and insignificant, and of a somewhat spathulate shape. There is nothing unusual in the ♀ apparatus to correspond to this curious development in the ♂. The armature of *T. antennatus* is almost identical with this, but on a rather smaller scale. The genus *Leptopterna* has an armature based upon the same principle, but with the left clasper very much smaller and far less fully elaborated (Butler, 42).

Distribution. *T. saundersi* again is not a widely distributed species, and, like the preceding, belongs to Northern Europe. It is recorded from Northern and Central Europe and Siberia, as well as from our own country, and extends into North America. In Britain it occurs in the coast counties from Yorks to Kent inclusive, and also in Dorset and Devon, as well as in Cumberland. There are no Welsh records, but it is found in both Scotland and Ireland.

It may be noted here that there is much variation in the colour of the species of *Teratocoris*, especially in *T. antennatus*, and there seems to be a great tendency for green to pass into red and *vice versa*. The lightest specimens of *T. antennatus* are hardly to be distinguished from typical *T. saundersi* in coloration, but *T. antennatus* may always be recognised by the almost glabrous condition of the basal antennal joint, the hairs being extremely minute and difficult to see. *T. saundersi* has very distinct hairs on this joint; in *T. viridis*, which also has hairs, this joint is considerably shorter than in *T. saundersi*, and the insect also is smaller. *T. antennatus* ♀ almost always has a central black line running through the head, pronotum, and scutellum, but occasionally this is reduced to a short line on the vertex or is altogether missing. Usually, also, even if the broad fuscous markings near the elytral suture have disappeared, the actual inner margin of the clavus is infuscated; but again, this feature occasionally disappears as well as the central line on the fore parts, and the insect assumes the coloration of *T. saundersi*, which is always immaculate. The ♂ of *T. saundersi* has similarly a black central line, which sometimes expands into a black triangle at the apex of the scutellum, and sometimes ceases at the end of the pronotum, leaving the scutellum immaculate. *T. viridis* ♂ has more black about the fore parts, but is best distinguished by the shorter basal joint of the antennae. It must be admitted, however, that this species is not very well defined. From the above it will be seen that, on the whole, the most reliable criterion for specific determination is to be found in the nature of the basal joint of the antennae (Butler, 42).

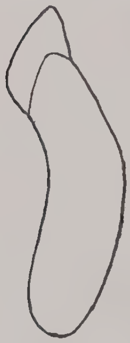
263. **Leptopterna ferrugata** Fall. (Miris id. Reut. & Osh. Cat.).

Fall. Hem. Suec., i, 129, 2 (1829); D. & S., B.H. 295 (1865); Saund., H.H.B.I. 227 (1892).

Ova. Length, $1\frac{3}{4}$ mm. Eggs, apparently ripe, taken from the body of a ♀ were of a yellowish colour of the usual Capsid shape, tubular, strongly and rather abruptly curved, with the anterior end very obliquely truncate, and the posterior rounded.

Larvae. "Larva: Elongata, virescenti-albicans, sub-opaca, pallido-pubescens, furca antrorsum vergente capitis, oculis, antennis pedibusque nec non stria utrinque corpus percurrente lata griseo-fuscescentibus; antennis pedibusque densius pilosulis; rostro apice tarsisque nigris; pro- et meso-noto aequilongis; abdomine corpore reliquo aequilongo; coxis albidis" (Reuter, 2).

The above description applies to several instars, measuring 3, 5, and 6½ mm. in length, probably the third, fourth, and fifth. But there is a curious difference in the last instar; some specimens have the wing-pads extending to the middle of the third abdominal segment, while others have them quite rudimentary; these, no doubt, correspond to the macropterous and brachypterous forms respectively. The larvae of this species may be distinguished from those of *Miris* and *Megaloceraea* by the shorter, stouter, and more hairy legs and antennae, and the less elongated head, which has no longitudinal furrow.



Egg of *Leptopterna ferrugata* Fall.

Life-cycle. The imago has been found from June to September, but the majority occur in July and August. The larvae appear in May. I have not been able to find any records for the imago, outside the limits of the above four months, and it may fairly be concluded that this is not a hibernating species, but that the insects die off in the autumn after having accomplished oviposition. The eggs must be laid in well-protected places, as they have to endure the vicissitudes of the winter; they are probably imbedded in grass stems.

Habitat, etc. This insect occurs in grassy places, amongst tall grass and other luxuriant vegetation, and is of course taken by sweeping. Parfitt, however, records it from oaks, and J. E. Mason (1) found one on the Mumby sandhills.

It is dimorphous in the ♀ only; the ♂ is always macropterous and readily uses its wings; the ♀ is most usually brachypterous, with hemielytra abbreviated in all their parts, especially the membrane, and reaching about half way down the abdomen, and the wings rudimentary and triangular. Of course, this quite unfits the insect for flight, and even the macropterous examples must in consequence of the great weight of the abdomen, find far more difficulty than the ♂ in flying. In fact, I do not remember to have seen this sex on the wing. The macropterous ♀♀ occur not infrequently. Reuter mentions an instance in which a nymph of this species sucked dry another Hemipteron which was enclosed with it.

The scent of these insects is very strong and of the usual repulsive character; this species, however, is not so strong as the next. Curtis took a ♀ of this species paired with a ♂ of *L. dolabrata*.

Distribution. It is distributed over the whole of Europe to 69° N. lat. and passes into Algeria, Asia Minor, Turkestan, and Siberia. In Britain it is of very general occurrence and is recorded for twenty-eight English counties ; I have no records for Westmorland, Derby, Staffs, Salop, Leicester, Rutland, Hunts, Beds, Northants, Worcester, Monmouth, and Middlesex. Welsh records are from Carnarvon, Carmarthen, and Glamorgan. It is found in both Scotland and Ireland. It is quite rare in Suffolk (Morley, 4).

264. **Leptopterna dolabrata** L. (Miris id. Reut. & Osh. Cat.).

Lin., S.N. v, 730, 103 (1767) ; D. & S., B.H. 297 (1865) ; Saund., H.H.B.I. 227 (1892).

Ova. The eggs are almost indistinguishable from those of *L. ferrugata*, but perhaps a little narrower. Yellowish white, of the usual Capsid tubular shape, rather strongly and abruptly curved anteriorly, with the end very obliquely truncate ; posterior end rounded ; collar considerably wider than the body of the egg, whitish. I have taken twenty eggs from a brachypterous ♀, but Osborn records as many as seventy. The macropterous ♀ does not produce nearly so many ; in fact, if she did, flight would be difficult on account of the weight of the body. There are often no eggs at all, and Osborn regards about two as an average for the macropterous form, although so small a number of course almost entirely neutralises any advantage that the presence of fully developed wings may give. The pregnant brachypterous ♀ is much too heavy to fly, and when thrown into the air makes no effort to do so, but drops helplessly to the ground. The eggs are laid in the stems of timothy-grass, and sometimes in clover stems. They seem to be placed, as a rule, so near the ground in hay-fields that they are mostly left behind when the grass is cut.

The following interesting account of oviposition is given by Osborn : " When about to oviposit, the female seeks a suitable place on the stem, more frequently with the head upward, but often in the reverse position, and explores the stem carefully with the beak. She appears to make a slight puncture with the beak, then draws the abdomen at a sharp curve up under the thorax and places the tip of the ovipositor on the spot where the beak has rested. The ovipositor is withdrawn from its sheath and stands at nearly right angles to the genital segment, and the insect with all legs clasping the stem and evidently strained very tensely begins a swaying movement forward and backward, working the tip of the ovipositor slowly into the stem. If unable to start it promptly, she may shift her position and reinsert the beak, then begin again with the ovipositor. When the point of the ovipositor has been thrust in, evidently at the point where it has penetrated the outer wall of the stem, the body is pushed forward and the ovipositor pushed strongly downward and backward till it is embedded its full length. A few contractions of the abdominal segments serve to slip the egg along the ovipositor, a scarcely visible operation from the outside, and the ovipositor is quickly withdrawn. The slit in the stem closes up so as to be entirely invisible."

Larvae. " Larva parva : Albido- et fusco-virescenti-variegata, elongata, supra pilis brevibus nigris erectis densius hirta; capite pronoto latiore, sub-quinquangulari, sub-horisontali, albido, oculis, margine postico, clypeo lituraque media viridi-fuscescentibus; thorace supra virescenti-fusca, linea medía percurrente lateribusque nec non striis discoidalibus duabus incurvatis mesonoti albidis; pronoto mesonoto aequilongo; abdomine supra maculis fusco-virescentibus in seriebus quatuor positis notato; corpore subtus pectore fusco- et albido-variegato ventreque sordide virescenti-albido; antennis fuscis, basi articuli secundi ferruginea, vel totis ferrugineis; pedibus fuscis, brevius nigropilosis vel testaceis, coxis trochanteribusque albidis.

"Nympha mox ante explicationem: flavo-virescens, supra pilis erectis nigris brevioribus densius hirta, capite, thorace, dorsoque abdominis omnino ut in imagine coloratis; rudimentis alarum postice fuscis, limbo laterali flavo-virescenti; mesonoto pronoto paullo longiore, margine postico rotundato" (Reuter, 2).

To the above may be added the length of the insect in the different instars; first 1 mm., second 2 mm., third 3 mm., fourth 4 mm., fifth 5½–6½ mm. In the first instar the antennae are about twice as long as the body, but the proportion gradually diminishes till in the last instar they are only a little longer than the body. I do not find myself able to detect very easily the greenish tint which Reuter speaks of in the fuscous parts, but rather in the white parts; I think the whole insect might be described briefly as greenish-white with fuscous markings.

These larvae may generally be recognised in the net by their leaden-grey general tone, crossed by paler markings; of course, in the younger stages especially, the lens is required to show the exact nature of the markings.

Life-cycle. The larvae are hatched about the beginning of May (in America a little later), and mature by the end of June or beginning of July. Like the preceding species, the imago is found from June to September. Flor, however, gives a continental record for May. The majority appear in July. Osborn estimates the total length of larval life to be from thirty to thirty-five days. As with the preceding insect, there are no records for the imago outside the above months, so that no doubt the insects die in the autumn soon after oviposition. Their dead bodies would soon become disintegrated, or eaten by ants, etc., or would decay in the damp soil. The eggs would remain in the grass stems during the winter, and would hatch in the following May.

According to Meyer Dur, the ♀♀ appear rather before the ♂♂, and Osborn says that there is some reason to think that the macropterous ♀♀ develop slightly earlier than the brachypterous, so that possibly there might be some scattering of these, and an earlier egg deposition from them.

Habitat, etc. This insect occurs in dry grassy places, hayfields, and flowery meadows, and according to Reuter (12) especially on Compositae, and is taken by sweeping. In America it has been traced to timothy-grass (*Phleum pratense*) as its chief food-plant; but it has also been found on *Dactylis glomerata*, *Festuca elatior*, and *Panicum capillare* (not a British plant). Apparently there is little doubt as to its being essentially a grass-feeder, and yet there are also a few records of its acting the carnivore. Nowicki says that it attacks the Dipteron *Chlorops taeniopa*, and the Cambridge Museum contains a specimen of the larva which when captured was sucking the Dipteron *Medeterus micaceus* Loew. On the other hand, Osborn has the following passage: "Before the grasses head out, *Miris dolabratus* is found on the stems and leaves, but the larger part of the growth of the insect occurs after timothy begins to head. The heads seem to be the favourite point of attack. The insects cluster on the heads sometimes in numbers to a single head, and thrust their beaks down into the flowerets, evidently drawing their food from the tender parts of the blossom or from the forming seed. I have seen a female thrust her beak down in the flower of witch-grass (*Panicum*), piercing the glumes, or insert her beak between and down into the anthers, penetrating them and causing them to burst, and probably sucking juice from the ovules."

L. dolabrata is dimorphous in the ♀ only; the ♂ is always macropterous and the ♀ usually brachypterous, with the same structure and habits as the preceding species, but the macropterous ♀ is much less common than with *L. ferrugata*. The brachypterous ♀ manifests different degrees of development of the hemielytra. Usually they extend about half-way down the abdomen, while in the fully macropterous the membrane passes the extremity of the abdomen, and there may be varying degrees of development between these two extremes. It is always the membrane that suffers most curtailment. It would be interesting to note what degree of development is sufficient to give the power of flight, but the necessary observations are lacking. The shortening of the membrane must make the genital segment easier of access to the ♂, and possibly this rather than questions of flight may be a determining factor. The ♂ varies greatly in intensity of coloration, and its darker forms are remarkably handsome insects.

This species possesses an intensely strong and to human nostrils very disgusting odour, which is more pronounced in the ♀. So powerful is this odour that, in places where the insect is abundant, it sometimes infects the air around for a distance of several yards. Notwithstanding this, which might have been expected to be a powerful deterrent to the attack of enemies, it has been found as prey in the nest of the spider *Theridium sisyphium* (Verhoeff, 2). Osborn states that *Nabis ferus* is the chief enemy of the larvae, and he adds: "We have had them (*Nabis*) live and thrive in confinement and progress to the adult stage on a diet of *M. dolabratus*." The Tachinid fly, *Phorantha occidentis*, has been bred from *L. dolabratus* as a parasite, and several American spiders have been found to entrap it. Curtis once took a ♂ of this species paired with a ♀ of *L. ferrugata.*

Bueno records its having been taken at light in America.

This species and the preceding have been accused of causing injury to corn crops, but concerning this charge Parfitt observes: "I am much inclined to believe myself that they are more the farmer's friend than his enemy, as I think these species feed on the Aphides found on grasses and on the corn."

It is unfortunate that the specific name of this insect is always wrongly spelt in our British catalogues, and the later text-books. I have restored the original and correct spelling which is with an "a" and not an "o" in the middle, *dolabrata* and not *dolobrata*, being derived from the Latin *dolabra*, a military axe, though what the connexion is may not be easy to see. American authors also use the true form of the name.

Distribution. It ranges over the whole of Europe and Siberia and has been introduced into America where it is widely spread. In Britain it is one of the most widely distributed species, being recorded from thirty-one English counties. I have no records from Staffs, Derby, Salop, Rutland, Lincs, Hunts, Beds, Glo'ster, and Monmouth; the Welsh records are from Carmarthen and Glamorgan, and it is found in Scotland, but is not recorded from Ireland. Its absence from Lincolnshire lists is very curious, considering the great care with which that county was worked by Mr. J. E. Mason.

Division *b*. *RESTHENIARIA* (formerly Loparia).

This division, which is chiefly Neotropical, contains some very brilliant insects, in which there are often startling contrasts of black and red. Our British representatives consist of three insects only, belonging to the only Palaearctic genus *Lopus*, easily distinguished by their dull black colour, brilliantly ornamented with bright red or yellowish markings. In Oshanin's Catalogue twelve Palaearctic species are enumerated.

265. **Lopus gothicus** L. (gen. Capsodes Reut.).

Lin., F.S. 966 (1761); D. & S., B.H. 475 (1865); Saund., H.H.B.I. 231 (1892).

Ova. Unknown.

Larvae. I have larvae in three instars, taken at Boxhill, which may possibly belong to this species. They are black with the abdomen dorsally of a vinous red, each segment being almost filled up on each side by a blackish bar; beneath, on each side a pale vinous red longitudinal fascia, corresponding in position and appearance to that of the adult. The whole insect is very hirsute, with long black hairs exactly like those of the adult. The shape of the pronotum is hardly what one would have expected for a *Lopus*, but the wider one's experience, the more one is prepared for the unexpected, and certainly the vestiture exactly agrees. Lengths of the three instars, 2½ mm., 3 mm., 3½ mm. If these do not belong to this species, it is very difficult to say what else they can represent. They are certainly not *Orthocephalus*, nor *Polymerus*, nor *Heterocordylus*, nor *Rhopalotomus*, all of which are well known. However, I fear I must leave the matter undetermined. These larvae were taken on May 31st, 1919.

Life-cycle. The imago occurs from May to August, and I have found larvae as above in May.

Habitat, etc. I have found it generally by searching at the roots of coarse herbage and occasionally by sweeping. It has occurred on several plants; *Rubus idaeus* (J. Edwards), *Salix repens* (Carr), *Galium* (Fieber), *Epilobium* (Lethierry), *Achillea* (Duda), *Crataegus oxyacantha* and *Prunus spinosa* (Spitzner), *Urtica* (Hahn). Meyer Dur considers the latter to be "accidental," and adds the following note as to its occurrence in Switzerland, "I always found it on warm slopes facing south on corn or on *Ononis* and *Galium*, on which latter plants especially it appeared in great swarms and sucked the nectar of the flowers." But, considering the great variety of the plants above mentioned, it would appear that its occurrence on any one of them is hardly other than "accidental," and there is a strong presumption that its diet is, at any rate in great part, of an animal rather than a vegetable nature. Exact observations on this are much to be desired. Morley (4) records the var. *superciliosus* from white poplar.

This insect is dimorphous in the ♀; the brachypterous form has the hemielytra shortened, especially the cuneus and membrane, so as barely to reach the end of the abdomen, and sometimes they are considerably shorter than this. The brachypterous is the commoner of the two forms.

The amount of the orange or yellow coloration also varies; Reuter mentions four vars., two distinguished by letters only and the other two *elegans* Reut. and *superciliosus* L. The last named is almost wholly black above, only the lateral stripe to the corium and sometimes the margin of the pronotum slightly, and the extreme apex of the scutellum yellow. The amount of whitish colour on the sternum and abdomen also varies. The var. *elegans*, which appears to be found in the ♂ only, has an orange vitta running along the cubital vein and joining the marginal vitta. This var. has not yet been recorded from Britain. The two unnamed vars. differ only in the amount of the orange or yellow coloration and in the intensity of the colour, and the different forms run into one another.

Distribution. It occurs throughout Europe, and extends into Siberia and Algeria. In Switzerland it reaches a height of 3000 feet. In Britain it is found in the following English counties: the coast counties from Northumberland to Devon, except Lincs, and in Cumberland, Staffs, Notts, Warwick, Oxon, Bucks, Middlesex, Surrey, Berks, and Wilts; in Wales the only record is from Glamorgan. There are none from either Scotland or Ireland. Morley (4) states that the type form is not found in Suffolk, though he has met with the var. *superciliosus ;* one of the specimens of the latter has the scutellum red. I have a similar specimen *ex coll.* Capron, and therefore possibly from Surrey.

266. **Lopus flavomarginatus** Don.

Don. Brit. Ins., vii, 79 (1798); D. & S., B.H. 476 (1865) (miles); Saund., H.H.B.I. 232 (1892).

Ova. Unknown.

Larvae. I took two larvae in the last instar in Epping Forest on the 5th June, 1915. One almost immediately moulted, yielding a ♂ imago. The other died before moulting. Length 4 mm. Eyes rather prominent, body rather broad oval, antennae as long as the body. Of a reddish-brown colour, more or less mottled and spotted with darker, the intensity of the colour varying in the two specimens ; legs dark, intermediate and posterior femora with a wide white ring round the middle, anterior femora with a similar but much less distinct ring. This last feature is very characteristc and appears equally in the cast skin.

Life-cycle. The imago is met with from June to August, and, as above mentioned, the larva in its last instar has occurred at the beginning of June. The insect is distinctly an early summer species, and apparently dies off before autumn.

Habitat, etc. I have usually found it by sweeping in rather damp grassy and flowery places in forest land, especially where wild roses were growing. Douglas and Scott (1) record it from toadflax (*Linaria vulgaris*), Morley (4) found it on oak and poplar, Chitty took it on broom. Morley (4) also found it on seeding *Heracleum sphondylium* flowers, where he considers it was preying on Aphides. This would be in accordance with the variety of host plants.

This is certainly a very local species, though I have found it not uncommon in Epping Forest ; Morley (4) also finds it not uncommon in Bentley Woods in Suffolk, and W. West took a good many specimens at Abbey Wood and Plumstead, Kent.

It is very much like the continental *L. mat* Rossi, but that is a larger and more brightly coloured insect, with the pale femoral bands much less distinct. It varies somewhat in coloration ; there is usually a central pronotal vitta of a more or less orange colour, but this is frequently obscure and sometimes altogether missing, and sometimes the marginal vitta also disappears more or less completely, and this occasionally happens with the lateral stripe on the corium. Saunders says " all the tibiae and the posterior femora have a pale ring " ; the tibial rings, however, are often very obscure, while *all* the femora are provided with a pale ring, those on the intermediate and posterior pairs being particularly distinct ; but those on the front pair are often hardly distinguishable.

Distribution. This seems to be by no means a common insect on the Continent; it is recorded only from France, Spain, Italy, and Corsica. In Britain it is not quite so widely distributed as the preceding species; it is recorded from all the coast counties from Suffolk to Cornwall, except Dorset, and from Staffs; there are no records for Wales or Scotland, but Haliday records it from Ireland.

267. **Lopus sulcatus** Fieb.

Fieb. Eur. Hem., 268 (1861); Saund., H.H.B.I. 232 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. Like the preceding, this species is met with from June to August in the adult condition, and is thus an early summer insect, probably dying off in the autumn.

Habitat, etc. It has occurred on a number of flowering plants: *Rubus* flowers (Saunders), *Umbelliferae* (Parfitt), *Senecio vulgaris*, *Chenopodium ficifolium*, *Anthyllis vulneraria*, *Malva*, and *Echium* (Bignell).

The ♀ is brachypterous, having short hemielytra, with almost rounded cuneus and extremely rudimentary membrane, the whole reaching about two-thirds of the length of the abdomen. The ♂ is always macropterous. One variety is described, *luctuosus* Put., but this is from the South of France.

Distribution. On the Continent the distribution of this species is even more restricted than that of the preceding; it is recorded only from France, Spain, and Sardinia. In Britain also it occupies a very restricted area in the South-west of England, viz. the four counties of Hants, Somerset, Devon, and Cornwall, and there are no records from any other parts of the British Isles; Bignell seems to have been the chief captor of this species.

Division *c*. *CAPSARIA*.

This division contains the most conspicuous and many of the most beautiful of our British *Capsidae;* it includes fifty-two species distributed amongst upwards of twenty genera. The Palaearctic species enumerated in Oshanin's Catalogue are nearly six times as numerous as this, so that our British representatives of this group form but a small fraction of the whole. Very little is yet known, comparatively, of the exotic species; additions are constantly being made and doubtless very large numbers still await description or indeed discovery. The Capsaria are probably chiefly vegetable feeders, but some certainly prey upon other insects. A little less than half the British species are arboreal in habits, while the rest are found upon low plants. A few hibernate as perfect insects, but the majority probably die in the autumn, and in such cases oviposition must take place in that season also, while it may be assumed that over-wintering species perform oviposition in the spring.

Table of the *CAPSARIA*.

(40) 1. Cuneus distinct; hemielytra never abbreviated.
(7) 2. Head channelled in centre.
(6) 3. Channel distinct.
(5) 4. Antennae with third and fourth joints together much shorter than second. 1. *Pantilius.*
(4) 5. Antennae with third and fourth joints together about equal to second. 4. *Megacoelum.*
(3) 6. Channel very indistinct. 5. *Adelphocoris.*
(2) 7. Head not channelled.
(9) 8. Species ochreous with brown stripes. 2. *Miridius.*
(8) 9. Species not ochreous with brown stripes.
(11) 10. Membrane marbled, posterior legs very long. 3. *Phytocoris.*
(10) 11. Membrane not marbled, posterior legs moderate.
(13) 12. Rostrum reaching beyond posterior coxae. 9. *Stenotus.*
(12) 13. Rostrum not reaching beyond posterior coxae.
(21) 14. Species larger, 7–10 mm.
(20) 15. Species pubescent.
(17) 16. Rostrum reaching beyond intermediate coxae. 6. *Calocoris.*
(16) 17. Rostrum not reaching beyond intermediate coxae.
(19) 18. Basal joint of antennae shorter than head. 7. *Homodemus.*
(18) 19. Basal joint of antennae not shorter than head. 8. *Pycnopterna.*
(15) 20. Species glabrous, deeply punctured. 19. *Capsus.*
(14) 21. Species smaller, less than 7 mm.
(25) 22. Species impunctate.
(24) 23. Species red and green. 10. *Dichrooscytus.*
(23) 24. Species green with yellowish margin. 11. *Plesiocoris.*
(22) 25. Species punctured.
(39) 26. Species more or less pubescent, sometimes (*Liocoris*) subglabrous.
(38) 27. Second antennal joint not strongly clavate.
(37) 28. Pubescence distinct.
(32) 29. Pubescence not golden and deciduous.
(31) 30. Head very little broader than apex of pronotum. 12. *Lygus.*
(30) 31. Head considerably broader than apex of pronotum. 13. *Camptozygum.*
(29) 32. Pubescence golden and deciduous.
(36) 33. Clavus and corium finely punctured.
(35) 34. Corium variegated. 14. *Poeciloscytus.*

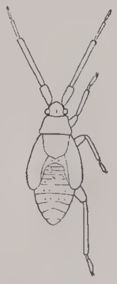
(34)	35. Corium black.	15. *Polymerus.*
(33)	36. Clavus and corium strongly punctured.	16. *Charagochilus.*
(28)	37. Pubescence very indistinct; insect subglabrous.	17. *Liocoris.*
(27)	38. Second antennal joint strongly clavate.	20. *Rhopalotomus.*
(26)	39. Species glabrous, strongly punctured.	18. *Camptobrochis.*
(1)	40. Cuneus not distinct from corium; hemielytra usually abbreviated.	
(42)	41. Pronotum not constricted.	21. *Pithanus.*
(41)	42. Pronotum deeply constricted.	22. *Myrmecoris.*

268. **Pantilius tunicatus** Fab.

Fab. Mantiss., ii, 303, 242 (1787); D. & S., B.H. 333 (1865); Saund., H.H.B.I. 230 (1892).

Ova. Unknown.

Larvae. The larvae can quite easily be recognised; their shape in the later stages is similar to that of the adult, and in all stages the shortness of the last two antennal joints is sufficiently distinctive. They are green, with the fore parts, especially the head, more or less reddish or brown; a row of black dots on the hind margin of the abdominal segments, and one conspicuous black dot in centre of second abdominal segment. In the latest instars the fore parts are still more tinged with reddish-brown, which is also well marked on the wing-pads; the hinder part of the pronotum is pale. In all instars a pale line runs down the middle of the fore parts. Legs covered with dark spots, greenish, becoming slightly brownish at end of tibiae; last tarsal joint black. Antennae reddish; apex of second, third, and fourth joints darker. A series of black dots at lateral margins of abdomen. Underside clear green.



Nymph of *Pantilius tunicatus* F.

Life-cycle. I have found larvae just maturing on birch in August; but again I have found larvae in all stages, from almost the youngest, and none mature, in the middle of September, and these were on alder. And again, I have found all stages, including a few just matured, at the end of August; these were on hazel. For the adult I have records for all months from April to November, except May. These seem to point to the hibernation of the species as imago. But the records of the larvae as above which indicate an interval of about two months between similar stages is rather puzzling, as such an interval is hardly enough to admit of a second brood, and yet it is difficult to believe that over-wintered specimens would oviposit so late in the season as the second observation implies. It is difficult also to believe that the difference of food-plant shown above is the determining factor for the period of emergence.

Habitat, etc. This species is arboreal in habits and is found on the leaves of various trees, such as hazel, birch, alder, *Prunus domestica*, and *Berberis*. Schumacher (5) adds *Alnus incana*. Hazel, however, seems to be the chief favourite. The imago is not very active, remaining at rest unless disturbed; the antennae are carried, when the insect is at rest, pointing straight forward and near together. The cast skins show no colour, but the black dots stand out very distinctly.

Distribution. This species is distributed throughout the whole of Europe and in the North of Persia; in Britain its area is a wide one; it is recorded from all the English coast counties from Northumberland to Glo'ster, except Durham and Hants, and also from Cumberland, Cheshire, Notts, Leicester, Warwick, Hereford, Oxon, Bucks, Herts, Surrey, Berks, and Wilts; the only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland.

269. **Miridius quadrivirgatus** Costa.

Cost. Regn. Neap. Cent., iii, 22 (1852); D. & S., B.H. 300 (1865); Saund., H.H.B.I. 233 (1892).

Ova. Unknown.

Larvae. These, in the last instar, are similar in shape to the adult. Length 6 mm. Of a delicate olivaceous green, with three white stripes running the entire length of the insect; thus the olivaceous green forms on the head two stripes, and on the pronotum four, which correspond to those that in the adult are brownish-red; the connexivum is bounded inwardly with a white stripe and is outwardly also rather indefinitely whitish; thus the abdomen shows five white stripes; wing-pads whitish, with three longitudinal olivaceous stripes; legs greenish-white, with the femora (especially posterior pair) rather indistinctly mottled; whole of upper surface with a few scattered, stout, long black hairs; legs and antennae also with long blackish hairs; clypeus very prominent; pronotum transverse with angles rounded; end of last tarsal joint and claws black; underside pale greenish; posterior femora long, giving some little leaping power.

Described from specimens received from Mr. T. Edmonds.

Life-cycle. I have found the larvae in the last instar at the beginning of August in the Isle of Wight, but again I have received the same instar from Mr. T. Edmonds, of Totnes, towards the beginning of July. The imago has been taken in July and August, and on the Continent also in June, but there are no records outside these three months.

Habitat, etc. This insect is taken by sweeping in dry places amongst long grasses, chiefly on open ground not too far from the sea; the farthest distance from the sea that it has been taken is about 12 miles. Its striped coloration at once suggests its grass-loving habits. Douglas and Scott (1) refer to its having been found on dwarf sallows at Deal.

Distribution. It is found in Central and Southern Europe, including Algeria and Tunisia; it is also recorded from the islands of the western half of the Mediterranean, and Syria. It is with us chiefly a littoral insect, and in Britain has been recorded from coast counties only, viz. Suffolk, the coast counties from Kent to Cornwall, and Glamorgan. There are no records for either Scotland or Ireland. In my own experience it has always occurred near the sea, though not actually on the coast, and the farthest place inland was at Robertsbridge in Sussex, about 12 miles from the coast (Butler, 8). I have specimens *ex coll.* Capron, but as there is no record of locality attached it is not safe to assume that they were taken in Surrey, where Dr. Capron made most of his captures; in fact the presumption is that they were not, as Saunders does not include the species in his list in the "Victoria County History of Surrey."

270. **Phytocoris populi** L.

Lin., F.S. 963 (1761); D. & S., B.H. 302 (1865) (v. distinctus); Saund., H.H.B.I. 235 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from June to November, and the larva in May (Meyer). August and September are the chief months for the imago in the open, though in gardens the season is somewhat earlier, as I have found them abundant in June.

Habitat, etc. I have found it (especially the var. *distinctus*) on the trunks of apple trees and pear trees in gardens, as well as on oaks in woods. On the trunks it is difficult to detect, as it lies rather flat on the bark; it runs up and down the bark and generally has the head directed towards the ground. Morley (4) found it on alders in marshes, and the var. *distinctus* on aspen and under limes; Norman on willows; Carr on *Buxus* and on trunks of all kinds of garden trees, including sycamore; Dalla Torre on roses. It is also found on various species of poplar; Reuter (12) gives *Populus balsamifera* as well as *Salix capraea*, *Sorbus aucuparia*, *Alnus incana*, *Ulmus*, *Acer*, *Fraxinus*, and *Tilia*. Marshall found a belated specimen on the trunk of an oak tree at Cheltenham in November. The species is, I believe, always arboreal in its habits. Reuter (12) distinguishes four varieties by letter only except *distinctus*. They differ simply in the degree to which the black markings extend.

Distribution. It is found throughout Europe and in Algeria. In Britain it is pretty widely distributed; the English counties in which it has occurred are twenty-four in number, viz. the coast counties from Northumberland to Glo'ster, except Lincs, and in Cumberland, Lancs, Notts, Leicester, Worcester, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts; the only record from Wales is that of v. *distinctus* from Glamorgan, but it is found in both Scotland and Ireland, in the latter the type form only.

271. **Phytocoris tiliae** Fabr.

Fab., S.R. 237, 169 (1803); D. & S., B.H. 303 (1865); Saund., H.H.B.I. 235 (1892).

Ova. Length 1 mm. Colour reddish-yellow, tubular, slightly curved, especially anteriorly, posterior end rounded, anterior truncate, almost at right angles to the axis of the egg in that part, collar not projecting laterally.

Larvae. The larvae of this genus are so much like the perfect insects that there is little difficulty in recognising them generically; but the individual species present the same sort of difficulties as do the imagines. In the present instance the last instar measures from 4 to $4\frac{1}{4}$ mm. Pale greenish, more or less suffused with pale whitish ochreous and mottled with fuscous; head ochreous, with two brownish suffused spots at vertex; pronotum trapezoidal with front angles rounded, greenish white with broad black lateral margins and a central mark consisting of two brownish sinuous lines meeting at the apex; scutellum ochreous suffused with brownish; wing-pads pale whitish ochreous, with three transverse fuscous fasciae, the first at base, united inwardly to the second which is a little before the middle; third apical; abdomen dull green with central white line on which is a red spot a little before middle; a row of black elongate spots on each side parallel to margins of abdomen, space between them thickly covered with brown spots, legs and antennae distinctly barred; black bands of legs except basal one, a little narrower than white ones; hind femora with two broad blackish bands near the apex. The whole insect is furnished with long black and white hairs, and the basal antennal joint has strong black spine-like hairs similar to what occur in the adult.

Preceding instar, 3 mm., similar to above. The most réliable characters to distinguish this species are the black pronotal margins, the black hairs on the basal antennal joint, and the shorter antennae and legs than are found in the other species.

Life-cycle. The imago is found from June to October.

Habitat, etc. This species lives on a great variety of trees, and is by no means confined to the lime as its name seems to imply; in fact it is much more commonly taken on other trees. I have always found it most commonly on oaks, but have also taken it on the trunks of lime, apple, and pear. Carr found it in crevices of bark of fruit trees, and on hawthorn. Reuter (12) gives a long list of trees as follows: *Tilia*, *Quercus*, *Populus*, *Acer*, *Alnus*, *Corylus*, *Betula*, *Ulmus*, *Salix*, *Prunus cerasus*, *Castanea vesca*, *Laurus nobilis*. Morley (4) took it at sugar on oak trunks. In its markings it closely mimics lichens; but it does not appear to frequent lichen-infested trees. Breddin has, however, the following note: " On ne sait pas de quelle façon l'insecte se nourrit. Quelques naturalistes prétendent qu'il perce l'écorce, d'autres qu'il guette les petits insectes inoffensifs; une chose, cependant, est certaine, c'est que le mimetisme dont il vient d'être question a un caractère purement defensif." Kaltenbach says that this species feeds on small insect-larvae and plant-lice.

It is a most variable insect, and Reuter (12) enumerates five varieties besides the typical, all distinguished by names, as follows :

> (i) *cretacea* Reut. Albicans, dilute fusco-signata, pronoto lateribus late fuscis, limbo basali striis nigris quatuor notato ; scutello apicem versus vittis duabus parvis divergentibus fuscis, hemielytris fasciis transversis duabus late dilute fuscis, altera ante medium, altera ante maculam apicalem rhomboidalem.
>
> (ii) *signata* Reut. Ut in var. *typica*, sed hemielytris densius nigromarmoratis, commisura, basi corii, macula infra medium maculaque apicali interiore albidis, hac antice distincte nigro-terminata, clavo nigro-conspurcato, cuneo ut in var. *typica* ; pronoto limbo nigro-laterali cum fascia basali nigra saepe confluente, hac angusta, saltem medio interrupta. ♂.
>
> (iii) *ferruginea* Westh. Ut praecedens, sed superne colore leviter in ferrugineum vergente.
>
> (iv) *maculosa* Westh. Hemelytrorum maculis confluentibus, valde extensis, saturate nigris ; clavi margine scutellari, sutura, corii vitta media obliqua, gutta apicali trapezoidali, nonnullis guttulis, cunei basi pallidis ; pronoto et scutello ut in var. *typica*.
>
> (v) *marmorata* D. & S. Superne albo-virens ; pronoto limbis lateralibus fasciaque basali confluentibus, hac medio in maculam maximam saepe callos attingentem, postice sinuatam producta (callis, vittis duabus pone eos fasciam basalem attingentibus limboque basali medio latiore albido-virentibus) ; scutello vittis divergentibus duabus nigris ; hemielytris fasciis duabus latis nigris pallido-adspersis, altera ante medium corii interne in clavum producta ibique dilatata, altera ad apicem corii interne supra maculam corii apicalem pallidam profunde sinuata, cuneo striâ basali marginis interioris apiceque latius nigris.

There is very little fixity about these vars. and they run into one another more or less. This species can easily be recognised by the green colour when that is present, and in other cases by the black sides of the pronotum and the shortness of the antennae ; the lateral black stripes, however, sometimes almost if not quite disappear, especially in the greener forms. The proportionate lengths of the black and white bands on the intermediate tibiae are not easy to estimate, and therefore are not very reliable for diagnostic purposes. Another useful feature is the long, black, spine-like hairs on the basal joint of the antennae.

Distribution. It occurs throughout Europe and in Algeria. It is common in many parts, but not equally so in all countries. In Britain it is one of our commonest and most widely distributed species of *Phytocoris*. It is recorded from twenty-nine English counties, i.e. from all except Westmorland, Staffs, Derby, Salop, Rutland, Hunts, Beds, Warwick, Worcester, Northants, and Monmouth. The only records from Wales are from Brecknock and Glamorgan, but it is found in both Scotland and Ireland.

272. **Phytocoris longipennis** Flor.

Flor. Rhyn. Liv., ii, 601, 6 (1861); D. & S., B.H. 307 (1865) (dimidiatus); Saund., H.H.B.I. 236 (1892).

Ova. Length 1½ mm. Colour greenish-yellow; tubular, only slightly curved, broadest near the posterior end which is rounded, anteriorly truncated, the truncation being only slightly oblique; egg narrowest a little below the collar, which does not project laterally.

Larvae. Last instar, 4¼–4½ mm. Pale greenish-white, with pale fuscous markings, the whole insect furnished with fine long black and white hairs; pronotum trapezoidal, with brownish lateral margins, much less distinct than in the preceding species; wing-pads irregularly mottled, with a dark spot at apex; hind femora more or less mottled throughout, more closely at apex; legs with long silky hairs; basal antennal joint mottled with brown and furnished with long hairs which are neither so stout nor so dark as in the preceding species; white bands of tibiae generally much wider than the black ones. This species in its larval condition could only be confounded with *P. tiliae*, from which the absence of the deep black borders to the pronotum, the finer hairs on the basal antennal joint, and the longer antennae and legs will distinguish it.

Life-cycle. The imago is found from July to October, and chiefly in August and September. I have found the larva sometimes as late as August. There is little doubt that the active life of this extremely fragile species is bound, so far as the imago state is concerned, between the limits of the above four months. For the larval existence we may probably date its activity from some six weeks earlier.

Habitat, etc. This species also is arboreal in habits; it is found chiefly on hazel, oak, and hawthorn, of which the first two are the most favoured. It is, however, found on other trees as well; Morley (4) records it from birch, holly, and poplar; Carr gives also *Populus tremula*, and *Salix*; Reuter (12) adds to the above *Fagus*, *Tilia*, *Prunus domestica*, *Platanus*, and *Acer*; and J. Sahlberg *Ulmus*, *Larix*, and *Alnus incana*. This species does not vary nearly so much as the preceding; Reuter describes only one variety besides the type form, viz. *signata* Reut. which differs by its much darker and more fully marbled hemielytra. But this is only a matter of degree, and there are intermediate forms.

It is curious that the long hairs with which the body is covered in the larval condition almost completely disappear. They are retained on the margins of the abdomen, and on the hemielytra are reduced to a quite short and more or less curved pubescence; the dorsum of the abdomen is quite glabrous, and tactile hairs would of course be useless on this part of the body when it is covered by the wings.

Distribution. This again is a species belonging chiefly to Northern and Central Europe; it does not seem to pass south of the Pyrenees, Alps, and Balkans; in Finland it reaches a northern limit of 61° 30′. In Britain it is widely distributed, being recorded from thirty-one English counties, i.e. all except Westmorland, Staffs, Salop, Rutland, Beds, Warwick, Northants, Monmouth, and Dorset. There are Welsh records from the counties of Carnarvon, Brecknock, and Glamorgan, and it occurs in both Scotland and Ireland.

273. **Phytocoris dimidiatus** Kb.

Kb. Caps., 122, 2 (1855); D. & S., B.H. 305 (1865) (dubius); Saund., H.H.B.I. 237 (1892).

Ova. Unknown.

Larvae. Last instar, 5 mm. Greenish, very much mottled with fuscous; on the abdomen the mottling is chiefly in the form of transverse fasciae; a large black spot on each side of the last three abdominal segments, just inside the connexivum; a pale central longitudinal line to the head, pronotum, and mesonotum; second and third antennal joints with a narrow white ring in the middle, legs with rather narrow white rings to the tibiae; femora strongly mottled with fuscous, especially towards the apex, hind pair with a rather strongly marked subapical white ring; tarsi black, with second joint slightly yellowish; whole upper surface with scattered, almost upright black hairs; hind tibiae with long black hairs, especially near the base; first antennal joint with stout, long black hairs, especially on the inner side, long black hairs also to second joint. This larva is much like that of *P. longipennis*, but rather larger, stouter, and of a brighter green colour.

Life-cycle. The imago is found from June to September, and I have found the larva in its last instar in August.

Habitat, etc. This is another arboreal species, but with a less wide choice than the two preceding; it occurs chiefly on oak. Morley (4) has taken it on ash, and also at sugar on willow; Reuter gives in addition to oak, only *Prunus domestica* and *Populus*; J. Sahlberg gives *Alnus glutinosa.*; Lethierry has recorded it as found in France on *Pinus*, but Reuter thinks this should rather apply to an allied species *P. intricatus*, which has not yet been found in Britain. Similarly he considers Jakowleff's record of *P. dimidiatus* on *Larix sibirica* in Siberia, as possibly referring to some other species. Carr beat it from *Rubus*.

Distribution. This insect has a much more restricted distribution than the two preceding; it is recorded from Northern and Central Europe and from Siberia. In England it is recorded from seventeen counties, viz.

Cumberland, Yorks, Lancs, Cheshire, Notts, Norfolk, Suffolk, Northants, Warwick, Bucks, Essex, Kent, Surrey, Sussex, Hants, Wilts, and Devon. There are no records from Wales, but it has been found in both Scotland and Ireland.

274. **Phytocoris reuteri** Saund.

Saund. Syn., ii, 265 (1875); D. & S., B.H. 309 (1865) (crassipes); Saund., H.H.B.I. 236 (1892).

Ova. Unknown.

Larvae. Last instar, 5 mm. Fusiform, dark brown, slightly mottled; tibiae with narrow white bars; basal antennal joint with numerous long dark hairs, second joint with a small white bar in the middle; a pale line through pronotum and scutellum, interrupted on pronotum; pronotum narrow, trapezoidal, margined, and slightly sinuate at sides.

Life-cycle. The imago has been taken in June, August, and September.

Habitat, etc. This is less distinctly an arboreal species than any of the preceding. I have taken it by sweeping amongst coarse herbage, and also amongst rushes; according to Reuter (12) it is found on pear, elm, and poplar, and Douglas and Scott (1) record it from apple trees.

It varies a good deal in depth of coloration, and Reuter (12) distinguishes three varieties, as follows:

> (*a*) Pallidus, cinerascenti-flavens, pronoto lateribus fasciaque ante marginem basalem fuscis, hemielytris sat dense sed minute fusco-conspersis, macula anteapicali pallida basi interne latius nigro-fusco-terminata. ♀.
>
> (*b*) Obscurius sordide griseo-flavens, pronoto lateribus saepeque etiam basi late nigro-fuscis, hemielytris fuscis, pallido-conspersis, et nigro-variegatis. ♂ ♀.
>
> (*c*) *nigrofusca* Reut. Ut var. (*b*), sed pronoto lateribus discoque usque ad callos nec non hemielytris nigro-fuscis, his solum macula corii apicali pallida signatis, cetero totis immaculatis.

Distribution. Very little seems to be known of the distribution of this insect; according to Reuter it is recorded from Holland, France, Hungary, and Rumania, in addition to our own country; Oshanin adds Germany. In England it has been recorded from nineteen counties, viz. Northumberland, Notts, the coast counties from Lincs to Somerset except Devon, and from Leicester, Cambs, Hunts, Surrey, Berks, Oxon, and Wilts; the only Welsh record is from Glamorgan, and it is not mentioned in any lists from either Scotland or Ireland. Collectors seem to be often puzzled by it; it is perhaps less distinctly marked than any of our other species. The angular mark on the corium is often very plain.

275. **Phytocoris pini** Kb.

Kbm. Caps., 200 & 283 (1855); Saund., H.H.B.I. 237 (1892).

Ova. Unknown.

Larvae. Reuter (2) gives merely "Nympha colore imagini valde similis." To this may be added that its smaller size, shorter legs, and antennae, and especially the shorter basal joint of the antennae, will easily distinguish it from the other species.

Life-cycle. I have taken the imago in August, Reuter took it in October. I have received full-grown larvae at the end of July, from Cumberland.

Habitat, etc. This species, the smallest of the genus in our fauna, is found on fir trees, chiefly *Pinus sylvestris*, but also on *P. austriaca*, *Picea excelsa*, *Abies pectinata*, *A. alba*, *Larix europaea*; Norman found it also on *Juniperus communis* (Reuter, 19).

Distribution. It occurs over the greater part of Northern and Central Europe, at least as far as Finland in the north and the Carpathians in the south, and also in Sicily. In Britain it has been found chiefly in Scotland, where it is not uncommon; the records from south of the Tweed are from Herefordshire, where I took a single specimen on a spruce fir at Kenchester in 1913; from Notts, where Prof. Carr took one in Sherwood Forest in the following year; from Yorks (Fordham), Durham (Harrison), and Lincs, and from Cumberland, where Messrs. Britten and Routledge have taken it not unfrequently. Thus its farthest south is at present Herefordshire.

276 **Phytocoris varipes** Boh.

Boh. Vet. Ak. Handl., 107 (1852); D. & S., B.H. 313 (1865) (ulmi); Saund., H.H.B.I. 238 (1892).

Ova. Unknown.

Larvae. Closely resembling those of the following species (q.v.) but differing in the more slender and less hairy basal joint of the antennae.

Life-cycle. This insect matures a little later than *P. ulmi*. The imago has been found from July to October, but it occurs chiefly from the middle of August onward.

Habitat, etc. This species is distinctly *not* arboreal. It occurs amongst low plants, about the roots of which the larva lives; there is also a specially dark and rather small form found on heaths, under the plants of *Calluna*. J. E. Mason (3) found it in W. Cornwall on thistles, and it may be met with at the roots of grasses and rushes. Though not strictly an arboreal species, it is yet occasionally found on trees and shrubs and is a frequent inhabitant of hedges. Thus Reuter (12) gives *Pinus sylvestris*, *Juniperus*, *Ribes rubrum*, *Rubus fruticosus*, and *Spartium*, together with the following herbaceous plants: *Calluna*, *Thymus*, *Compositae*, including *Cirsium*, *Tanacetum*, and *Artemisia*, *Plantago cynops*, *Clinopodium*, *Linaria vulgaris* and *Galium*; Schumacher adds *Centaurea*. Such a multiplicity of host plants, of such widely divergent botanical positions, surely indicate an animal diet.

Though possessed of well-developed saltatory hind legs, it leaps but feebly, and is altogether a less active insect than the succeeding species. Reuter describes two varieties, one with the basal joint of the antennae scarcely longer than the pronotum, which seems to be the normal form, and the other, *leptocerus*, with that same joint a little thinner and as long as from the posterior margin of the pronotum to the middle of the eye; this seems to represent the smaller and darker form which we find upon heaths.

Distribution. This is a widely distributed species occurring over the greater part of Europe except the extreme north; it passes into Algeria, the Caucasus, and Turkestan. In England it is common and has a considerable range, being recorded from twenty-five counties, viz. all the coast counties from Northumberland round to Glo'ster, except Lincs, and from Notts, Leicester, Cambs, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts. The Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is recorded from Ireland, but not from Scotland.

277. **Phytocoris ulmi** L.

Lin., S.N. 503, 110 (1767); D. & S., B.H. 311 (1865) (divergens); Saund., H.H.B.I. 237 (1892).

Ova. Unknown.

Larvae. Reuter's (2) description is as follows: "Nympha imagini colore simillima, sed tibias habet anteriores fere innotatas, posteriores autem annulis tribus fusco-rufis distinctis signatas."

This may be supplemented thus:

1st instar. Length just under 1 mm. In this instar the anterior femora are as distinctly banded as the others, although the bands are not quite so broad; the reddish-brown colour of the markings is due to the superposition of two distinct colours upon one another, an inner fuscous, and an outer bright red, which in this early instar can be easily seen to be distinct. The terminal joint of the antennae is stouter than the rest, and the strong black hairs on both the basal joint of the antennae and the legs, which are marked features in the adult, are differently disposed; the basal joint of the antennae is almost destitute of them, but they are well developed on the inner surface of the second joint, from which, in the adult, they have entirely disappeared; they are present also, and of great length, on the posterior tibiae, where they represent, though in much greater proportionate length, the spine-like hairs of the adult. The whole dorsal surface also is furnished with similar hairs, widely scattered and few in number. Of the two-jointed tarsi, the basal joint is very minute.

2nd instar. Length nearly 2 mm. In this instar there is very little change, save that the femora have become rather darker, and the abdomen rather redder, while the rings to the anterior tibiae are not quite so distinct.

3rd instar. Length $2\frac{3}{4}$–3 mm. Here again there is little change except in size and a general deepening of colour.

4th instar. Length $3\frac{1}{4}$ mm. In this instar the rudiments of the wing-pads appear, and the hairs, both on the body and the legs, are greatly developed; this is especially the case with the hind legs, where the anterior margin of the femora and the outer margin of the tibiae carry particularly long and well-developed hairs; none of these, however, show any trace of the spine-like structure which they finally assume. By this time the colour has become more or less of a dark chocolate-brown, mottled with ochreous. The bands on the anterior tibiae and the antennae have become fainter.

5th instar. Length $4\frac{3}{4}$ mm. In this instar the wing-pads are fully developed, and extend almost half-way down the abdomen. In other respects it is similar to the preceding, but the colour is deeper, and the integument of a somewhat firmer consistency. The vestiture is still in the nature of hairs, and there is still no trace on the tibiae of the extremely short adpressed pubescence which ultimately covers their whole surface, nor of the stout spine-like hairs which ultimately rise from amongst this at regular intervals. It will be seen, therefore, that the changes undergone by the insect at its last ecdysis are more profound than at any other of the crises in its career. The external changes include the complete development of the hemielytra and wings, the loss of the vestiture of the dorsal surface. of the abdomen, and its transference, so to speak, in an altered form to the hemielytra, the complete remodelling of both legs and antennae by the reduction of their thickness, the clothing of them with a close adpressed pubescence, and the equipment of the tibiae with a whole armature of spinous hairs, which have no exact equivalent in the previous instars, and finally the division of the long terminal tarsal joint into two. Of course, the internal changes, involving as they do the maturation of the reproductive organs, and the transference of the openings of the scent-glands are equally profound.

Life-cycle. The imago may be found from June to October, and it matures about a fortnight or three weeks earlier than *P. varipes*, and hence is, as a rule, quite full-grown before the end of July. The larvae in the first three instars as described above were all found at Royston, on May 27th, 1912, those in the fourth instar in Epping Forest on June 15th in the same year, and the fifth instar in the same place on June 22nd, 1911. This latter would probably have yielded an adult about the beginning of July, which is generally about the earliest date, though, as mentioned above, it is occasionally a little earlier. The eggs evidently hatch at intervals from about the beginning of May, and the young larvae continue to appear during that month.

Habitat, etc. The larvae are found in similar positions to those of *P. varipes*, except that they do not, so far as I know, frequent heaths. But they live in shelter under low plants, at the roots of grasses and so forth. When they have assumed the adult form, they come out from their retirement, and take up their quarters in nettle-beds, in hedges, and also generally on trees. Of these, Reuter (12) gives the following list: *Ulmus*, *Acer*, *Prunus*, *Alnus incana*, *Quercus*, *Betula*, *Corylus*, *Crataegus*, and *Salix*; sometimes also (19) on conifers such as *Pinus sylvestris*, and on *Juniperus*. To these he also adds *Spiraea salicifolia*. Morley (4) adds to these poplar, and the umbels of Umbelliferae, and Carr, *Anthemis*, *Senecio jacobaea*, and *Rubus*. Douglas and Scott give black currant bushes and J. Sahlberg red currant and gooseberry. In this country *Crataegus*, *Corylus*, and *Quercus* are probably the favourite trees; but the insects are also very devoted to nettle-beds.

This great variety probably indicates carnivorous habits.

Distribution. This insect occurs over almost the whole of Europe, and in the United Kingdom it is one of the most widely distributed of the *Capsidae*. It is recorded from thirty-two English counties, i.e. all except Westmorland, Staffs, Derby, Salop, Rutland, Hunts, Beds, and Northants. The Welsh records are from Carnarvon, Brecknock, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland.

278. **Megacoelum infusum** H. S. (Calocoris id. Brit. Cat.).

H.S. Wanz., iv, 30, fig. 381 (1837); D. & S., B.H. 331 (1865); Saund., H.H.B.I. 244 (1892,.

Ova. Unknown.

Larvae. Larva taken in Epping Forest, July 15th, 1912. Third or fourth instar. Length 2¾ mm. Body ovate; red, becoming flavous on head and pronotum; a central whitish streak down pronotum and mesonotum; on each side of this a crimson line closely bounding it on the pronotum, and diverging from it on head and mesonotum; femora reddish-brown, tibiae yellow, fore pair infuscated at apex, and hind pair more or less reddish-brown for two-thirds of its length, tarsi yellow, infuscated at apex; antennae reddish-yellow in first two joints, third slightly infuscated, fourth red, third joint stouter than second and angular, fourth stouter than third and cylindrical, antennae as a whole much longer than the body. It can easily be recognised by the form of the antennae and the coloration; the stout antennae, thickest at the tip, are quite characteristic; these are not only proportionately, but actually much thicker than in the adult.

Last instar, 4½–4¾ mm. Lighter or darker orange, or with abdomen red; a central longitudinal line through pronotum and scutellum clear yellow bordered with red; pronotum and wing-pads much infuscated; antennae infuscated at apex, structure as in earlier instar; femora and apex of tibiae reddish-brown; apex of tarsi black. It can always be recognised by its colour and the stout antennae.

Life-cycle. The imago is found from July to October, but most of the specimens mature in August. The eggs probably hatch near the beginning of June.

Habitat, etc. This is an arboreal insect, and is found chiefly on oaks, but Bedwell has obtained it from *Pinus sylvestris* (Morley, 4). Morley (4) swept one at dusk from *Hypericum hirsutum*, and I have taken it on palings. Reuter (12) gives in addition *Betula*, *Tilia*, *Pinus maritima*, *P. pinaster*, *Populus pyramidalis*, *Juniperus*. There are many records of its having been found on conifers on the Continent, and, according to Reuter (19), this is not because of its seeking shelter on such trees during the time when oaks are leafless, but because it spends its whole life upon them; but there is the possibility that these records from coniferous trees may refer to the next species, *M. beckeri*.

It varies considerably in coloration, and Reuter distinguishes three varieties as follows :—

(*a*) Superne fere unicolor, rufo-testacea, scutello medio saepe fusco. ♂.

(*b*) Pronoto plerumque limbo basali, ipso margine excepto, scutello medio vel toto, clavo basi anguste, corio macula vel fascia apicali nigro-piceis, corio apicem versus cuneoque miniatis. ♂♀.

(*c*) Pronoto fere toto, scutello, clavo limbo toto interiore apiceque, corio fascia lata apicali, cuneo basi et apice nigro-piceis, abdomine saepe toto nigro-piceo.

All three of these are found with us, the first being perhaps the least common; but intermediate forms occur in all degrees.

Distribution. This species is almost confined to Central Europe, from the Atlantic to the Carpathians; it extends northwards to the middle of Sweden. In England it is recorded from seventeen counties, viz. all the coast counties from Norfolk to Cornwall, together with Cheshire, Notts, Cambs, Oxon, Herts, Middlesex, Surrey, and Berks; there are Welsh records from Carnarvon and Glamorgan, but it has not been found in either Scotland or Ireland.

278a. **Megacoelum beckeri** Fieb.

Fieb. Vert. Z.B.G. Wien., 259 (1870); Ent. Rec., xxxi, 9.

M. beckeri is very closely allied to *M. infusum* H. S., and for its recognition no more is needed than to mention the points of difference. *M. infusum* is always described as glabrous on the upper surface, and this is sufficiently accurate for all practical purposes, though I find that in most specimens there are two or three long and very fine erect hairs, usually either on the disc of the pronotum or at the apex of the corium close to the cuneus.

M. beckeri, on the other hand, is, when in good condition, abundantly supplied on its upper surface with long erect hairs which, however, are very easily rubbed off. The hind tibiae of *M. beckeri* also have both the black setae on their outer edge and the fine hairs on their inner, evidently longer than in *M. infusum,* and there are similar long hairs on the hind margin of the posterior femora near the apex. It is also a slightly larger and more robust insect, and the antennae are a little stouter. All the British examples I have seen have been of the dark var.

Ova. Unknown.

Larvae. Last instar, 4 mm. Castaneous brown with border of wing-pads lighter, head reddish ochreous; antennae with two basal joints reddish ochreous, two apical castaneous; anterior tibiae reddish ochreous; head convexly triangular, with red streaks; pronotum trapezoidal, hind margin somewhat rounded; antennae very stout; upper surface with a few short hairs; hind tibiae with long black setae outwardly and fine hairs inwardly.

Life-cycle. The larvae have been taken in July, and the imagines in August and September.

Habitat, etc. This insect was discovered by Mr. Donisthorpe by beating Scotch fir. In each case in which the bug was found there was an ants' nest at the foot of the tree belonging to *Formica rufa,* and no specimens were found on trees not so accompanied. Reuter (16) gives as the habitat *Ulmus,* etc., but what the " etc. " covers nowhere appears, and it may, perhaps, include fir trees, as suggested under the preceding species.

Like *M. infusum, M. beckeri* varies a good deal in colour; the typical form is pale ochreous or testaceous, but there is a varietal form which is dark, rufo- or castaneo-testaceous, with the cuneus bright red and the hind tibiae dark. Our specimens are of this varietal form.

Distribution. On the Continent *M. beckeri* is reported from Central and Southern Europe, and appears to be a little more southern in its distribution than *M. infusum.* In Britain it has thus far been taken only at Weybridge and Oxshott in Surrey, and by Mr. Donisthorpe (Butler, 57).

279. **Adelphocoris lineolatus** Goeze. (Calocoris id. Brit. Cat.).

Goeze, Ent. Beitr., ii, 267; D. & S., B.H. 325 (1865) (chenopodii); Saund., H.H.B.I. 243 (1892) (chenopodii).

Ova. Unknown.

Larvae. These are dark green, with the fore parts more or less tinged with brownish, especially in the later instars; legs thickly spotted with dark brownish; tarsi and antennae black or dark fuscous. They can easily be recognised by the colour and the stout antennae which are equally thick throughout, except of course the first joint.

3rd instar. Length $2\frac{3}{4}$ mm. Pronotum very transverse, body narrow oval, furnished with short stout black hairs, which also clothe the legs; basal joint of antennae stout and rounded, with a few strong black hairs, remaining joints with finer adpressed hairs.

4th instar. Length a little over 3 mm. Similar, but with rudiments of wing-pads, and with longer hairs.

5th instar. Length 6 mm. Body rather broad oval; pronotum much deeper, with anterior angles rounded; black hairs longer and more conspicuous, especially a row springing from black points on each segment of abdomen, near its hind margin; hind femora on anterior surface with strong black spine-like hairs, tibiae with two rows, inward and outward, of similar hairs; the whole of the integument alutaceous, and therefore the colour rather dull; basal joint of two-jointed tarsi minute.

Life-cycle. The imago occurs from July to October, and on the Continent it has been found in both May and June. Larvae, even young ones, may be found till late in August, although the majority mature near the beginning of that month.

Habitat, etc. With us this insect most commonly occurs on *Ononis*, but it has been found on other plants as well, of which Reuter (12) mentions *Chenopodium*, *Trifolium*, *Leguminosae*, *Umbelliferae*, *Eryngium*, *Carduus*, *Salvia*, *Euphorbia*. Morley (4) has taken it on *Vicia sativa*. In 1912 I had a rather curious experience in the district of Snowdonia in N. Wales; in all the country on the north side of the Snowdon range, as well as on that range itself on its northern face, no *Ononis* could be found, and the nearest specimens I discovered of it were on the north coast of Carnarvonshire, about 6 miles from Snowdon itself. Here it was growing pretty commonly, but *A. lineolatus* was not to be found upon it; on the other hand, in the neighbourhood of Snowdon itself, where there was no *Ononis*, this bug was present and occurred on *Calluna*, which was in great abundance. I do not know any other record of the occurrence of this insect on heath, although of course it usually occurs in sandy places.

Jennings (7) records an interesting example of a carnivorous taste exhibited by this insect. An individual had been placed in a box together with a specimen of the Homopteron *Euacanthus interruptus*, and it was found later on with its rostrum fixed in the body of the latter, which it sucked completely dry. After a while it withdrew its rostrum and began to try other parts of the Homopteron in a manner highly suggestive of its being used to the business. It is remarkable also that this particular Homopteron is very strikingly marked with black and yellow, in a way that is usually considered to be of the nature of warning coloration. But, perhaps, any value that such coloration might have had for its owner would be rendered ineffective by the comparative darkness in which the insects were confined. At any rate, there is the fact that the strongly coloured insect did not prove unpalatable to its captor. This Hemipteron itself also has been found as prey in the nest of the spider *Theridium sisyphium* (Verhoeff, 2).

This species varies a great deal in coloration. Reuter names four varieties as follows :

> (*a*) *implagiata* Westh. Superne toto unicolor vel vena corii cubitali apicem versus infuscata. ♂♀.
>
> (*b*) *typica*. Ut (*a*), sed scutello vittis duabus mediis parallelis et appropinquatis nigro-fuscis, corio saepe ad venam cubitalem et brachialem vittis partis apicalis saepe in plagam confluentibus, angulo interiore extremoque apice cunei fuscis ; interdum etiam vitta media commissuraque clavi fuscis.
>
> (*c*) *binotata* Hahn. Ut praecedens, sed pronoto maculis duabus disci postici late distantibus nigris.
>
> (*d*) *bisbipunctata* Reut. Pronoto callis anticis transversis, maculis duabus rotundatis pone medium angulisque posticis nigris vel piceo-nigris ; cetero ut specimina obscuriora varietatis (*b*), sed minor. Long. ♂ $7\frac{2}{5}$–$8\frac{1}{2}$ mm.

Distribution. This is a most widely distributed species, occurring throughout the Palaearctic Region. The var. *bisbipunctata* is from Mongolia. In Britain also this insect has a wide range ; it is recorded from twenty-three English counties, viz. all the coast counties from Lincs to Somerset inclusive, together with Northumberland, Cumberland, Lancs, Cheshire, Notts, Leicester, Cambs, Oxon, Bucks, Herts, Surrey, and Berks ; from the three Welsh counties of Carnarvon, Carmarthen, and Glamorgan, and also from Scotland, but not from Ireland.

280. **Adelphocoris ticinensis** Mey. (Calocoris id. Brit. Cat.).

Mey. Caps., 100, 88, t. 6, fig. 1 (1843) ; D. & S., B.H. 330 (1865) ; Saund., H.H.B.I. 242 (1892).

Ova. Unknown.

Larvae. The half-grown larvae are very handsome ; a specimen measuring 3 mm. which I took at Rookley Wilderness, I.W., has the head, abdomen, and legs purplish-brown and the other parts green ; antennae long and of equal thickness throughout, though they look slightly clavate, as the fourth joint and the apical half of the third are dark fuscous, and the second and the remainder of the third green ; the basal joint is red ; the whole insect is sparingly covered with short black setae.

Life-cycle. The imago occurs from August to October, maturing in the former month, at the beginning of which larvae may still be found. In the south-west of France it is said to occur from May to August.

Habitat, etc. Like the preceding, this is not an arboreal species. It frequents very damp and marshy places, where it is obtained by sweeping the tall grasses that grow in such situations. It is a very lively insect, particularly in bright sunshine, and takes wing most readily, so that it is difficult to secure. Reuter (19) adds that it is found also on *Salix*, *Euphorbia*, *Juncus*, and *Juniperus*. In intensity of coloration it varies a good deal, but the paler forms may be those that have not been long disclosed.

Distribution. This is neither a common nor a widely distributed species. It is recorded from Central and Southern Europe, the Caucasus, and Central China. In Britain it is a rare species and has a restricted area ; the only records are from the seven counties of Norfolk, Cambs, Surrey, Hants, Dorset, Devon, and Somerset. It will thus be seen that its quarters lie chiefly south of the Thames. There are no records from either Wales, Scotland, or Ireland.

281. **Adelphocoris seticornis** Fabr. (Calocoris id. Brit. Cat.).

Fab. Mantiss., ii, 305, 269 (1789) ; D. & S., B.H. 324 (1865) ; Saund., H.H.B.I. 242 (1892).

Ova. These have the usual Capsid form, with well-developed collar at the anterior end. Leuckart adds the following particulars : Chorion thick and outwardly smooth, but inwardly granulated ; here and there is to be seen a thin canal-shaped passage which runs through the thickness of the chorion and fills the spaces between the protuberances of the inner surface with air ; the strongest granulations are invariably below the groove of the lid where the chorion is thickest ; height of collar very considerable, fully four times that of lid, especially on under side of egg, where the collar is occasionally more strongly developed ; micropyles placed all round collar, over thirty-five in number, appearing as fine canals which traverse the whole height of the collar perpendicularly, and open with a sharp bend into the egg beneath the groove of the lid.

Larvae. The larva is chiefly dark and similar in form to that of *A. ticinensis*. Head black ; pronotum brown with central furrow ; abdomen purplish-brown with a basal yellow band ; wing-pads almost black, with a yellowish lateral streak at the shoulder ; femora reddish-yellow with darker spots, tibiae testaceous with black apex and black spinous hairs ; tarsi black with basal half of second joint yellow ; antennae with basal joint yellowish, second reddish-brown, darker at apex, third and fourth black, the former with base and the latter with extreme apex reddish-yellow.

Life-cycle. The imago has been taken in Britain in July and August ; on the Continent its period ranges from June to September. I have found the larvae in the last instar early in August, together with imagines.

Habitat, etc. On the south coast of the Isle of Wight I have swept this species amongst vegetation consisting of long grass intermingled with a small vetch, probably *Ornithopus ;* in Switzerland I have taken it on the flowers of Umbelliferae. Reuter (12) gives in addition fields and meadows, amongst grass, and on *Ribes*, *Spiraea*, *Rubus*, *Cirsium*, *Urtica*, *Lamium*, *Chrysanthemum*, *Galium*.

In coloration it is very variable, and Reuter (12) describes three varieties as follow :

> (*a*) *nigra* Reut. Corpore superne toto, etiam cuneo toto, nigro ; solum margine basali pronoto pallido.
>
> (*b*) *plagifera* Reut. Ut var. (*a*), sed margine basali pronoti plagaque basali corii pallide testaceis ; cuneo nigro.
>
> (*c*) *pallidipennis* Reut. Hemielytris totis testaceis vel ochraceis, corio tantum angulo apicali externo cuneoque apice nigro, interdum clavo interne plagaque apicali corii interiore fuscis ; femoribus fusco-ferrugineis, fusco-maculatis.

It will be seen that these vars. depend upon the differing degrees to which the dark pigment is developed.

Distribution. Though rare with us, this species is found over the whole of Europe up to Lat. 63°, and also in Turkestan and Siberia up to China. In Britain it has occurred in five counties only, Yorks, Kent, Hants (I.W.), Dorset, and Devon. Its infrequency with us is not easily explicable, since it is a common species on the Continent.

282. **Calocoris bipunctatus** Fabr. (C. norvegicus Reut. & Osh. Cat.).

Fabr. Reis. Norv., 346 ; D. & S., B.H. 319 (1865) ; Saund., H.H.B.I. 244 (1892).

Ova. Length 1¾ mm. Of a yellowish colour, cylindrical, curved, with the collar rising higher on the convex side than on the concave, its margin being crenulated ; rounded posteriorly, obliquely truncate anteriorly. This is as taken from the body of the ♀.

Larvae. Last instar, 5 mm. Green, more or less rufescent in parts, but frequently wholly green ; the whole body sparsely covered with black hairs ; legs with stout black hairs, especially the two anterior pairs ; antennae more or less fuscous towards the apex ; head triangular, pronotum trapezoidal and very transverse, wing-pads large, extending about half-way down the abdomen ; their lateral margin curved ; outline of body oval ; antennal joints each less thick than the preceding, fourth joint almost filiform.

Life-cycle. The imago is found from June to October, and on the Continent in May.

Habitat, etc. This abundant species is found on a great variety of plants, but especially upon nettles. It also invades gardens, and thrives on the various kinds of garden produce. Parfitt mentions the heads of thistles, especially *Carduus arvensis*. Morley (4) mentions also *Tanacetum vulgare*, ragwort, *Vicia sativa*, and umbelliferous flowers. Mr. W. Evans of Edinburgh has sent me many specimens of this insect, taken near

Edinburgh, on the leaves, and, in one instance, on the flower of the common poppy, *Papaver rheas*. Bold says that in gardens it often renders the foliage of dahlias unsightly by puncturing the young leaves with its rostrum. Dalla Torre gives *Daucus carota*. To these Reuter (12) adds *Crambe maritima*, *Rubus idaeus*, *Artemisia vulgaris*, *Tussilago farfara*, *Cirsium oleraceum*, *Chrysanthemum*, *Medicago sativa*, *Allium*, *Euphorbia*, *Salvia*, *Lavatera*, *Ononis*. From this it will be seen that there is a strong preference for the Compositae, in fact, it may be said that this order and *Urtica dioica* share the chief attention of this insect. Of the other orders the most attractive is certainly the Umbelliferae, partly, no doubt, because the broad expanse of the flowers in this order gives as is the case with the larger composites, a good foothold, not only for this species, but for insects in general. The other orders mentioned above are *Cruciferae*, *Malvaceae*, *Leguminosae*, *Rosaceae*, *Labiatae*, *Euphorbiaceae*, and *Liliaceae*. Very noteworthy are some of the omissions in this list; thus there is no mention of *Ranunculaceae*, *Caryophyllaceae*, *Hypericaceae*, *Ericaceae*, *Primulaceae*, *Scrophulariaceae*, although these orders contain a large number of the most showy, and abundant of our wild flowers. I have sometimes found this insect with pollen grains adhering to it, so that it may be an agent in assisting cross-fertilisation.

Parfitt, writing of the Devon Hemiptera, has the following remarks: "At the time when the 'potato-blight' was prevalent, some thirty years ago, this insect was found in large numbers on the diseased plants, and was accused of being concerned in the disease. As the disease is caused by a microscopic fungus, of course the insect was not the primary cause of the failure of the plants; but when they attack the plants in numbers, living as they do upon the juices of the plants, they must naturally weaken them, and by this means render the plants more liable to the attacks of the fungus. I have frequently observed, in dry, hot seasons, that when these insects are numerous and have attacked the young shoots of plants, these shoots wither and die. They have been what is called in Devon 'stung.' Through this association it got the name of Potato Bug."

Three varieties are described by Reuter:

(*a*) Pronoto punctis disci destituto. ♀.

(*b*) *atavus*. Clavo vitta media, corio vittis duabus fuscescenti-ferrugineis; venis membranae ochraceis, raro rubris. ♂.

(*c*) *vittiger*. Superne ochraceus, punctis pronoti nigris sat magnis, etiam macula nigro-fusca utrinque ad angulum basalem; hemielytris subferrugineis, vitta media clavi vittisque corii duabus, per venas ductis nigro-fuscis, clavo apice late, corio basi externe cuneoque ochraceis; membrana fumata, venis ochraceis, raro rubris, disco infra apices areolarum hyalina. ♂ ♀.

Distribution. A most widely distributed species. It is found all over Europe, rising in Switzerland to a height of 3000 feet, and also in Algeria, Tunis, and Asia Minor; it occurs, moreover, in North America. In Britain it is one of our most widely distributed Hemiptera: it is recorded from thirty-three English counties, the only omissions being Westmorland, Staffs, Salop, Rutland, Hunts, Northants, and Monmouth; the Welsh records are from Carnarvon, Brecknock, Pembroke, Carmarthen, and Glamorgan; and it is found in both Scotland and Ireland.

283. **Calocoris roseomaculatus** De Geer.

De G. Mém., iii, 193, 32 (1780); D. & S., B.H. 327 (1865) (ferrugatus); Saund., H.H.B.I. 241 (1892).

Ova. Length 1½ mm. Very similar to the preceding, but rather shorter and stouter.

Larvae. " Nympha: supra rufo-brunnea, nitida, subtus flavo-virescens, antennis pedibusque rufo-brunneis, capite linea media angusta longitudinali, aliaque transversa verticis, thorace supra linea media lata longitudinali, abdomine marginibus lateralibus lineaque angusta dorsali flavescentibus; abdomine basi sulfurea; tarsis nigris (Reuter, 2).

The above description will suffice for the recognition of the species; the yellow line at base of abdomen is very constant even in the youngest instars; it need only be added that the transverse pronotum is sinuate at the sides, and its front angles are rounded; the posterior margin is somewhat curved. I have hitherto failed to discover the transverse flavescent line on the vertex; to me it seems rather that the whole outline of the face, from the vertex and the inner margin of the eyes to the clypeus, is slightly flavescent.

Life-cycle. The imago is found from June to October, and Reuter (2) records it on the Continent in April.

Habitat, etc. It is found by sweeping in dry places where there are many wild flowers. Both Norman and Morley (4) report it from *Ononis*, Hall (3) from *Eupatorium cannabinum*, and Dalla Torre gives *Cerastium*, *Trifolium*, and *Potentilla argentea*. Reuter (12) gives also *Chrysanthemum leucanthemum*, *Tanacetum*, *Achillea millefolium*, *Scabiosa*, *Umbelliferae*, *Galium*, *Lavatera trimestris*, *Eryngium*. Of these he considers *Chrysanthemum* to be the chief. Schumacher adds *Centaurea*.

It is very variable in colour, and Reuter (12) describes four varieties:

(*a*) Capite margine verticis postico nigro, fronte striis utrinque transversalibus, clypeo vittis duabus vel toto ferrugineis. ♂ ♀.

(*b*) Capite lutescente, margine postico, fronte vittis duabus basi conjunctis, apicem versus divergentibus, saepeque basi clypei fusconigris. ♂ ♀.

(*c*) Capite nigro, fronte marginibus orbitalibus vittaque media raro deficiente nec non genis luteis; pronoto saepe disco utrinque pone callum macula nigro-fusca. ♂.

(*d*) Antennis fuscis, articulo primo et basi secundi, capite toto, strictura apicali callisque pronoti, vitta scutelli nigris, pronoto plagis duabus discoidalibus, basi tibiarum posticarum tarsisque fuscis. ♂.

Distribution. This species also is very widely distributed; it occurs all over Europe up to Lat. 63° and rises in Switzerland to a height of 3000 feet. It extends also into Transcaucasia, Syria, and Algeria. In Britain it is less widely distributed than the preceding species, being recorded from twenty-three English counties, including all the coast counties from Northumberland round to Glo'ster except Yorks, together with Cumberland, Notts, Leicester, Worcester, Oxon, Bucks, Herts, Surrey, Berks, and Wilts; the only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland. In many of the above counties, however, there are large areas in which it does not occur, as, for example, Epping Forest and its vicinity in Essex. It seems to be rather partial to a chalky soil.

284. **Calocoris alpestris** Mey.

Mey. Caps., 49 (1843); Saund., H.H.B.I. 243 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago is found from May to August.

Habitat, etc. This is distinctly a mountain species, and is found by sweeping in flowery places. Reuter (19) gives as special plants on which it has been taken, *Convallaria verticillata*, *Cacalia albifrons*, *Urtica*, *Astrantia*. In the Carpathians it has also been found on *Picea excelsa*. As the *Urtica* is the only one of these low plants that is truly native to the British Islands, this list is not much of a guide to English entomologists. Mr. F. H. Day (4) has recently taken it on *Stachys sylvatica* in Cumberland, Mr. W. Evans on *Mercurialis perennis* and *Allium* at Hawthornden, Midlothian, and Mr. J. Murray (5) on raspberry. It is a fine looking insect when fresh, but as with most of our green species, it fades after death, becoming a dull yellowish-green.

Distribution. On the Continent it is reported from the mountainous parts generally. In Britain, it belongs chiefly to the north, being recorded from eight English counties, viz. Northumberland, Cumberland, Durham, Yorks, Staffs, Derby, Notts, and Somerset, and from Scotland. It has not yet been found in either Wales or Ireland.

285. **Calocoris fulvomaculatus** De Geer.

De G. Mém., iii, 294, 33 (1773); D. & S., B.H. 316 (1865); Saund., H.H.B.I. 240 (1892).

Ova. According to Theobald (1) each ♀ lays about one hundred eggs. In the case observed by him they were laid in hop gardens, where the insect proved itself a pest; they were laid upon the hop-poles, and upon the older bine.

Length 1½ mm. Of the usual curved cylindrical form, rounded posteriorly, somewhat truncate anteriorly, but with margin convexly rounded; the collar is large, and the egg is considerably contracted beneath it. Colour yellow.

Larvae. "Nympha rufo-brunnea, nitida, glabra; mesonoto dorsoque abdominis basi late sulfurescentibus, ventre medio dilute virescenti-flavo, interdum etiam lateribus et apice sulfurescentibus; antennis testaceis, apice articuli secundi nigricanti; femoribus tibiisque densius nigropunctatis, nigropilosulis, illis apice fusco-annulatis, his testaceis, nigrospinulosis, tarsis apice fuscis" (Reuter, 2).

To this one or two particulars may be added as follows, taken from larvae I have found in Epping Forest:

4th instar, 3½ mm. Wing-pads short, second joint of antennae very slightly clavate at apex, legs rather short.

5th instar, 4½ mm. Wing-pads longer, but not so long as in previous species; antennae, each joint thinner than the preceding, terminal joint filiform; second joint very slightly clavate at apex, legs proportionately longer than in preceding instar.

Life-cycle. Says Prof. Theobald (1): "During the first week in July the ♀♀ commenced depositing their ova on the bine in my breeding cages, and I have found similar eggs on the (hop-) poles. In all probability the ova will hatch this year and the adults will hibernate amongst rough herbage around the gardens, in the crevices of the poles, and under the bark, which is sometimes apparently left on them. . . . Several bugs were found in November in the latter position in some stacked poles at Albury, in Surrey." The imago is taken chiefly in June, July, and August, and as larvae are found, I believe only in May and June, it would seem that, if the eggs are, in normal conditions, laid in July, these cannot hatch till the next spring, and thus there would be only one brood in the year. In such case it is curious that there should be hibernating specimens of the adult; such insects would presumably not lay their eggs till the next spring, and would therefore tend to make good any accidents that might have befallen the autumn eggs.

Habitat, etc. It occurs on a variety of shrubs and trees, such as black currant, hazel, ash, birch, alder, *Salix repens*, but also on herbaceous plants such as *Umbelliferae* and *Urtica dioica*. I have found it common also on wild rose and apple; Dalla Torre gives *Prunus spinosa* and red currant, and Reuter (12) adds *Ledum palustre*, *Fagus*, *Rubus*, *Prunus padus*. Theobald (1) reports that in the year 1875 this insect did much damage to the hop gardens of Kent, where it was known amongst the growers as "shy-bug," in consequence of its timid and inactive habits. Hundreds could be caught in most gardens on the upper part of the bines sucking out the sap and leaving behind a distinct scar; they disappeared from the gardens at the end of July. Speaking of a subsequent attack, he says: "The destruction to the hop is caused by the insects attacking not the leaf but the bine itself. They puncture, by means of their long, sharp proboscis, the upper, tender parts of the bine, not only drawing out the sap, but leaving behind them a wound from which the sap continues to flow. The wound, when healed, is recognised by a distinct scar. I saw one garden during the latter part of June which were not half up the poles owing to these insects. As soon as the bugs commenced to attack the bine, a dense growth of low laterals was sent out, and this was one of the noticeable signs of the attack. . . . Like most of the bugs, it is more active during bright sunshine and in the middle of the day. It is an exceedingly timid creature and runs round the bine and hop-poles directly it is seen. On gently tapping the hop or pole they either fall *straight* down on to the lower leaves or ground, or else they fly rapidly off with a curious downward flight to some little distance off. With care they can, however, be watched, generally at the summit of the bine, with their long beak thrust into the plant tissue and working their head rapidly up and down as if pumping out the sap."

In the same paper Theobald adverts to the question of prevention and remedies. He says: "It will be well if growers at once abandon the idea that 'washes' will destroy these pests. I have tried at double their strength some that are said to be effectual, and find the bugs in a short time back again in their old position. It must be remembered that we are dealing with hardy insects which take their nourishment out of the inner part of the bine, so that any poison fixed to the plant would be valueless as a poison to them. Secondly, they are extremely active, and, even if they could be poisoned, there is great difficulty in reaching them, as they take flight at the least shock.

"'Jarring' in the same way as is employed for 'jumpers' is found to be valueless, as the insects fly to some distance and fall so close down amongst the foliage that they cannot be caught. I have experimented upon this *Calocoris* and other allied Heteroptera with various insecticides, both as poisons and odorants, and find nothing has any definite effectual result upon them; even strong paraffin, sufficient to burn up the plant, does not stop them returning in an hour or so. The only substance that has any prejudicial effect on the insect is soft soap, of greater strength than is generally employed. By using as much as 12 lbs. to the 100 gallons of water, numbers of these bugs are disabled if the wash is used when the day is dull, so that they do not so readily take flight.

"With such insects, however, what we must rely on are methods of prevention where practicable. That the ova are laid on pole and bine is certain, and that many of these remain as such throughout the winter we may naturally expect when we consider other closely allied forms. The adults also hibernate in crevices, etc., of the poles, and in the hollow pieces of bine, as well as amongst rough herbage around the gardens. If these hibernators and ova remain unharmed they will appear again next year and may find suitable weather, and so further increase and do similar damage another season. It is certainly advisable to get rid of these insects during the coming winter. Were it feasible, dressing the poles with a weak solution of corrosive sublimate or paraffin and soft soap will not only destroy the adults, but ova also. Secondly, the destruction even at a sacrifice of the old bine by burning would also lessen the chance of their future damage. If we find that, like many others of their tribe, some winter at the roots of their food-plant, light dressings of gas-lime worked in around the hills would be of service in destroying them. On the other hand, we must not forget that they are winged insects and may come from other parts, hence washing must be resorted to, and this can only be effectual upon the *wingless stages* early in the season."

Reuter states that on one occasion he saw several specimens sucking the dead body of a caterpillar.

Of two larvae that I took in Epping Forest, both of which looked equally healthy, one came to maturity in a few days, but the other, for no apparent reason, died. I set it by gumming it on card, and the next day on looking at it I was surprised to see that the body, which had been very plump, had entirely shrunk up, and by its side there was a footless maggot, evidently the larva of some Hymenopteron. This had eaten its way out of the body, which showed a large hole with jagged edges, where it made its exit. I at once sent this larva to Mr. C. Morley, who pronounced it to be probably that of a Proctotrupid, but unfortunately it did not reach maturity, and therefore the species could not be determined.

Of this most variable insect Reuter (12) enumerates six varieties which cause beginners much trouble ; they are as follow :

(*a*) Superne toto nigro-fusca, solum capite maculis orbitalibus angustioribus testaceis, cuneo medio testaceo vel coccineo.

(*b*) Superne nigro-fusca, capite limbis orbitalibus saepeque margine basali verticis et maculis genarum, pronoto limbo postico saepeque vitta media antice abbreviata, scutello angulis basalibus et apice fulvis ; hemielytris fuscis, clavo, commissura lata excepta, corio basi et limbo laterali (extremo margine nigro excepto) cuneoque testaceis, hoc angulo interiore apiceque fusco-nigris ; cuneo interdum medio miniato vel albo. ♂♀.

(*c*) Ut praecedeus, sed corio sordide fulvo-testaceo, plagis duabus apicalibus nigris.

(*d*) Superne fusca, capite macula orbitali utrinque, pronoto, lateribus vittisque duabus latissimis disci exceptis, scutello apice vel fere toto, hemielytris, plaga magna apicali corii, basi apiceque cunei exceptis, fulvis vel lurido-testaceis. ♂♀.

(*e*) Superne fulva, capite medio, pronoto callis plerumque ad partem, maculis magnis duabus disci angulisque posticis nigro-fuscis; corio plaga apicali ferruginea vel fusca; cuneo angulo interiore ferrugineo, apice nigro-fusco. ♀.

(*f*) Lurido-testacea, rubro-variegata; clypeo, fronte, genis basi bucculisque nigronotatis; pronoto callis postice nigricantibus, solum angulis basalibus rufescentibus nigro-marginatis; hemielytris isabellinis, nonnihil pellucentibus, corio apice marginibusque cunei rufo-ferrugineo-tinctis, apice cunei nigro-fusco. ♀.

This latter variety may be an immaturity, representing a recently disclosed individual.

Distribution. This is a very widely distributed species; it occurs throughout the whole of Europe and also Siberia, even into the Arctic regions (69°); it is found also in Syria, Algeria, and North America. In Britain it is not quite so widely distributed as might have been expected; it is recorded from twenty-three English counties, including all the coast counties from Norfolk to Glo'ster, together with Lancs, Cheshire, Notts, Cambs, Warwick, Worcester, Oxon, Bucks, Herts, Middlesex, Surrey, and Berks; the only Welsh records are from Merioneth and Glamorgan, but it is found in both Scotland and Ireland.

286. **Calocoris sexguttatus** Fabr.

Fab. Mantiss, ii, 304, 254 (1787); D. & S., B.H. 322 (1865); Saund., H.H.B.I. 241 (1892).

Ova. Length 1½ mm. Yellow, more or less infuscated; tubular, strongly curved anteriorly where it is obliquely truncate, rounded posteriorly; of nearly equal diameter throughout; surface smooth, shiny.

Larvae. I found several of these in their last instar on May 27th, 1912; they were on nettles at Royston, Herts. I kept some of them till they matured. They fed upon the nettles with which they were provided, but also apparently upon one of their comrades, whose body I found dead the next day. I also saw one of them sucking this corpse. The larva in its last instar measures 5 mm. in length, and exhibits very little trace of the brilliancy of coloration which distinguishes the adult, as the following description will show: Body obovate; head with eyes broader than pronotum, shining black, and dark purplish-red at the vertex; pronotum trapezoidal, much wider behind than in front, dull blackish, with front margin, a central line expanded behind, and side margins very narrowly in front, posterior angles broadly, whitish: this arrangement of colour is repeated in the scutellum and wing-pads; the former has a central whitish line, and the latter have a broad lateral band of irregular outline inwardly, whitish ; abdomen dull, tibiae yellowish, fuscous at base and narrowly at apex ; tarsi black ; antennae long and slender, fuscous ; rostrum with stout basal joint fuscous, central parts pale yellowish, apex dark ; body broadest behind middle of abdomen.

The larva has also been once found by Mr. W. Evans on *Mercurialis perennis* at Edinburgh.

Life-cycle. The imago is found from June to August, the larvae completing their metamorphosis by the beginning of the former month. It is therefore a somewhat earlier species than many of the *Capsidae*, and in this respect agrees with the preceding species, although its period does not seem to last so long.

Habitat, etc. It is found by sweeping in grassy places and amongst nettle-beds, as well as on various flowers. Blathwayt says of the neighbourhood of Bath, " It swarms in places near here on the blossoms of various umbelliferous plants," and Parfitt found it on the umbels of hemlock (*Conium maculatum*) and on heads of tansy. On Loughrigg, a low mountain in the Lake District, I once found it extremely abundant and most conspicuous sitting on and crawling over the leaves of various plants ; I have also taken it by beating hedges. Mr. W. Evans found it abundantly near Edinburgh on foxgloves. Reuter (12) gives the following additional list of host- or food-plants : *Cicuta virosa*, *Astrantia*, *Aconitum septentrionale*, *Melampyrum*, *Aspidium filix-femina*, *Campanula*, *Ranunculus*, *Pinus*, and other conifers (19).

As shown above, the insect is evidently quite prepared to fall back on an animal diet if the need should arise.

This species has several varieties, of which Reuter (12) mentions three :

> (*a*) *insularis* Reut. Pronoto utrinque vitta lata marginali a margine postico callorum fere usque ad marginem basalem ducta, vitta media paullo ante marginem basalem abrupta, antice inter callos continuata ; corio basi usque ad medium limboque laterali flavis, ad suturam clavi autem nigro ; cuneo saepe aurantiaco. ♂♀.
>
> (*b*) *typica*. Pronoto utrinque solum medio macula semiovali flava, macula discoidali ovata longius ante marginem basalem abrupta ; corio limbo externo, ipsa basi excepta, dimidioque apicali nigris. ♂♀.
>
> (*c*) *vittifera* Reut. Pronoto ut in praecedente ; corio flavo, sutura clavi saltem medio, plaga magna apicali elongato-triangulari a medio usque in apicem ducta limboque laterali apicem versus late, basin versus saltem margine laterali tenuiter nigris. ♀.

Of these the first is found only in the British Islands, and so far as I know is the only form found with us ; the typical form, which is the usual continental one, is a finer insect than ours, rather larger and more strikingly coloured.

Distribution. This species is, with the single exception of Italy, confined to Northern and Central Europe, being absent from the greater part of Russia and the Mediterranean Region. In Britain it is widely distributed, but seems to be more plentiful in the north than the south ; it is recorded from twenty-five English counties, viz. all the six northern counties, together with Cheshire, Staffs, Derby, Notts, Leicester, Norfolk, Warwick, Worcester, Glo'ster, Herts, Middlesex, Kent, Surrey, Berks, Wilts, Dorset, Devon, Cornwall, Somerset ; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

287. **Calocoris ochromelas** Gmel.

Gmel. Syst. Nat., 2180 (1788) ; D. & S., B.H. 318 (1865) (striatellus) ; Saund., H.H.B.I. 239 (1892) (striatellus).

Ova. Length about 1¼ mm. This egg is smaller than might have been expected from the size of the insect ; it is cylindrical, not much curved and rather broad, rounded posteriorly, and obliquely truncate anteriorly with the collar sloping almost to a point on the convex surface. Colour yellow.

Larvae. " Nympha : Imagini simillima ; ovata, pilis longioribus nigris erectis hirta, capite testaceo, aequilongo ac lato, nutante, vittis longitudinalibus quinque clypeoque virescenti-infuscatis ; pronoto utrinque virescenti-infuscato, ferrugineo-tincto, stria media margineque postico sulphureis ; mesonoto sulphureo, striis duabus basalibus, basi latioribus, postice convergentibus, metanotoque, linea media angusta sulphurea excepta, virescenti-fuscis, vel fusco-virescentibus ; abdomine dorso pallide flavo, sat dense rufo-ferrugineo-tincto, vitta lata media obscurius ferruginea, pone basin et ante apicem pallide flavo-interrupta ; pedibus sordide fusco-virescentibus, nigro-pubescentibus, tarsis fuscis ; antennis nigro-pubescentibus, subferrugineis, articulo secundo tertio ⅓ longiore " (Reuter, 2).

This is given as a description of the "nympha," but as there is no reference to wing-pads, which the author usually speaks of as " rudimenta alarum," one cannot help thinking that it refers to one of the earlier stages, before the development of the wing-pads. Anyhow, there is the same degree of difference in the intensity of the coloration as exists in the adult. On specimens of the last instar which I possess, measuring 5 mm. in length, the wing-pads have on a ground colour of yellow, three basal, longitudinal reddish-brown stripes, the outer of which meets a small spot of the same colour situated on the costa ; at the end of the wing-pads is a large spot of the same colour ; two of these specimens also have on a yellow pronotum a set of four reddish-brown dots on each side situated as if at the corners of a square, and having a small cloud of the same colour in their centre. Another discrepancy is that my specimens show no trace of the rather long black hairs which Reuter speaks of; but of course these may be present in the earlier instars, disappearing at a later stage.

Life-cycle. This is one of the earlier species of the genus, and the imago is found from April to July. Many nymphs, however, may still be found in the beginning of June. By the month of August the insect has entirely disappeared, so that it probably spends not much more than six or eight weeks in the perfect state.

Habitat, etc. It is almost confined to oaks. It has been found, however, on beech, birch, sallow, hornbeam, and hazel, though unquestionably its preference is for oak. Fieber (2) says on Umbelliferae, and Dalla Torre found it on *Heracleum*; on to these it may possibly have fallen from trees above. In its fairly close adherence to one food-plant it differs greatly from the other species of the genus. Douglas and Scott (1) speak of it as found on trunks of trees and palings.

In coloration it varies considerably, according to the extent to which the dark margins of the nerves are developed; but the immaculate yellow scutellum and base of cuneus always remain distinct. The var. *fornicatus* Fieb., which seems to be a northern form, has occurred near Durham and at Carlisle; it is of a reddish-yellow colour, with the dark markings much reduced. When first disclosed, and after its pattern has become distinct, this species is of a paler colour, but darkens subsequently. This paler form appears to be what is intended in the following description by Reuter (12): "Pallidior, flavescens, lineis capitis maculisque quatuor pronoti fuscescenti-ochraceis; hemielytris venis utrinque ochraceo- vel aurantiaco-cinctis, cuneo apice fuscescente; pectore parce fusco-variegato; ventre flavo, medio vittaque lata utrinque fusco-ferrugineis."

Distribution. This insect occurs throughout the whole of Europe; in Britain it is very widely distributed, being recorded from twenty-seven English counties, including all the coast counties from Northumberland round to Glo'ster, together with Cumberland, Westmorland, Cheshire, Notts, Leicester, Cambs, Warwick, Oxon, Middlesex, Surrey, Berks, and Wilts, and from Scotland and Ireland, but there are no records from Wales.

288. **Homodemus M-flavum** Goeze. (Calocoris id. Brit. Cat.).

Goeze. Ent. Beitr., ii, 279 (1778); D. & S., B.H. 328 (1865) (marginellus); Saund., H.H.B.I. 245 (1892) (marginellus).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to August.

Habitat, etc. According to Reuter (12) this species is found on *Compositae*, *Bryonia alba*, and *Medicago sativa*; it seems to occur entirely on low plants.

Two varieties are mentioned by Reuter (12) as follows :

(*a*) Corio venis brachiali et cubitali magis minusve late flavicantibus. ♀
(*b*) Pronoto strictura apicali nigra.

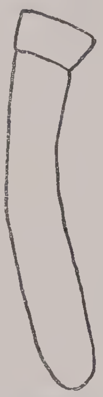
Distribution. It is found in Central and Southern Europe ; it appears to be absent from Russia and Scandinavia. In Switzerland it is often common, and rises to a height of 3000 feet. In Britain it can scarcely be regarded as indigenous ; only three or four specimens have been taken, and these many years ago ; most of them unfortunately are without localities and dates, and the only locality known is Charing, Kent. (Marshall.)

289. **Pycnopterna striata** Lin. (Calocoris id. Brit. Cat.).

Lin., F.S. 960 (1761) ; D. & S., B.H. 320 (1865) ; Saund., H.H.B.I. 245 (1892).

Ova. The egg is 2½ mm. in length. Specimens, apparently ripe, taken from the body of a ♀ were of a deep yellow colour, of the usual Capsid shape, tubular, slightly curved, rounded posteriorly, and anteriorly with a high collar surrounding the cap, of rather greater width than the body of the egg, and very finely crenulated in its margin. A micropylar canal is easily seen running round the summit of the collar, but the more intimate structure of the rest of the collar requires very high magnification to demonstrate it. This is the largest Capsid egg I have seen. Twenty-one eggs in all were taken from this ♀, most of them mature, but a few not quite fully developed.

Larvae. The larva is handsome and of striking appearance, entirely different from those of any of the preceding species. Reuter (2) gives the following diagnosis : "Nympha, fusca, nitida, abdomine supra basi dilutiore, segmento primo margine postico toto segmentisque duo (*sic*) et tertio angulis posticis sulfureis, ventre basi late virescenti-flavo, pedibus rufis."



Egg of *Pycnopterna striata* L.

To this the following particulars may be added :

1st instar, 1½ mm. Fuscous, with thoracic region reddish, and a trace of the yellow stripe at base of abdomen ; legs red ; antennae longer than legs, and more than twice as long as body.

2nd instar, 2½ mm. Reddish-brown, with abdomen black ; the hind margins of first two abdominal segments sulphur yellow ; antennae longer than legs, but less than twice as long as body ; legs red.

Last instar, 5–7 mm. Entire body black, except the two yellow transverse abdominal stripes ; legs red, antennae black with basal joint red ; body more or less cylindrical in shape, and not broad oval as in all the preceding species of Capsaria ; wing-pads slightly rounded, but much less so than in preceding species ; head deeply impressed with a V-shaped mark at vertex; pronotum trapezoidal, rather wider than long, narrower than head with eyes, and also than shoulders, and with a central furrow, on each side of which is a distinct fovea; the furrow continued on the scutellum; fore parts dull, and whole body sparingly furnished with very short black setae. This larva can always be easily recognised by its dark colour, the two transverse yellow stripes, the red legs and the cylindrical shape. The third and fourth instars are probably similar to the above, but I have no specimens.

Life-cycle. This is another of the earlier *Capsidae*, the imago appearing from the end of May to July; June is the chief month. The larvae in the first two instars mentioned above were taken on the 3rd of May, and the last instar from 27th May to 14th June. The youngest larva can hardly have been disclosed more than a day at the time of its capture, so that the six weeks running from the beginning of May to nearly the middle of June would probably be the extent of the larval life. As no imagines are found earlier than this, the implication would be that the eggs are laid during the summer, but not hatched till the next spring, and the insect's active life is limited to three months. The eggs described above were taken from a specimen captured in June, and most of them were evidently ready for laying.

Habitat, etc. The insect is arboreal in habits, frequenting chiefly hawthorn and oak, especially the former, at least with us, though curiously enough Reuter (12) does not mention *Crataegus* at all. He adds, however, the following list: *Alnus glutinosa, Salix capraea, S. cinerea, S. aurita, Pyrus malus, Sorbus fennica, Ribes rubrum, Prunus, Acer, Corylus, Ulmus, Betula.* Certainly no such variety occurs in Britain, though Norman reports finding the larva on crab-apple. Dalla Torre adds *Lonicera xylosteum*, and it has occurred on broom in Scotland.

I am indebted to Mr. J. Edwards for an interesting observation regarding this species. The insect, when at rest, carries its antennae, as so many of the Capsids do, turned back over its body, and placed parallel to one another along the middle line. In this position, each of the pale portions at the base of the third antennal joint comes just over the corresponding yellow stripe on the scutellum, thus harmonising or blending with the pattern of the scutellum, and preventing the obliteration of the yellow streaks to the observer, which the antennae, if wholly black, would produce. Whether such or any other is the purpose of the arrangement, or whether it is purely accidental, is not easy to say; it may be remarked, however, that a pale space at the base of the third antennal joint is a very common feature in *Capsidae,* and often exists where the scutellum is unmarked.

There is very little variation in this insect, the chief being the extent to which the yellow patch on the pronotum is developed; the femora are sometimes nearly black.

Distribution. It is found throughout the whole of Europe, up to Lat. 61° N. and also in Syria. In Britain it is pretty widely distributed, being recorded from twenty-two English counties, viz. all the coast counties from Yorks to Cornwall, together with Cumberland, Cheshire, Notts, Cambs, Hunts, Worcester, Glo'ster, Oxon, Herts, Surrey, Berks, and Wilts ; from Glamorgan amongst Welsh counties, and from both Scotland and Ireland.

290. **Stenotus binotatus** Fabr.

Fab., E.S., iv, 172, 130 (1794) ; D. & S., B.H. 323 (1865) ; Saund., H.H.B.I. 246 (1892).

Ova. The egg is of the usual Capsid type, with a well developed collar at the anterior end. Leuckart's description is the same as for *A. seticornis* (q.v.) with the following modifications and additions : micropyles about twenty to twenty-five in number ; the space inside the collar is quite filled with a honeycomb-like tissue, the cells composing which are parallel to one another, and like the walls of the collar in general perpendicular to the curve of the lid ; the outer openings of these cells are free and uncovered, and lie on about the level of the margin of the collar.

Larvae. Of the genus Reuter (2) says : " Nympha adulta imagine statura simillima, pedibus antennisque robustioribus et brevioribus, metanoto apice recto, rudimentis hemelytrorum hoc plus triente longitudini superantibus."

And of the species : " Nympha : virescens, breviter nigro-setosa, oculis, antennis, pedibus rudimentisque alarum paullo obscurioribus ; abdominis dorso basi puncto nigricanti."

To this may be added that the last instar measures 4–5 mm., and that the setae are particularly long and stout on the inner side of the tarsi and anterior femora ; the body is a rather broad oval, and the trapezoidal pronotum transverse.

Life-cycle. The season of the imago is from June to October, and on the Continent it is found also in May. Larvae may still be found up to the end of June.

Habitat, etc. With this species we descend again to low plants ; it is a common wayside insect, found on grasses and other plants both there and in rough meadows. The only plants given by Reuter (12) besides grasses are *Chrysanthemum leucanthemum* and *Erica.* It is sometimes attracted to light (Morley, 4).

This is a most variable species ; there is not merely the very different coloration of the sexes, but each of these varies indefinitely, especially as regards the amount and intensity of the black markings. No varieties have been named, and it is scarcely possible to do so, as they are all so intimately connected with one another. The insect is sometimes mistaken for *Calocoris bipunctatus*, chiefly, probably, because of the two black spots on the pronotum. But its smaller size and narrow and less robust build should easily distinguish it.

Reuter (12) points out that the orifices of the metastethium are quite small, but that they are prolonged externally into a rather long transverse furrow, which is not the case in *Calocoris*; and also that the terebra in the ♀ is unusually long; the practice adopted by British entomologists of mounting their specimens on card often causes these and other features of the underside to be missed.

Distribution. It is found over Europe, Asia Minor, and Syria, and also in North America, where it sometimes does damage to grasses; it extends also into the Ethiopian region. In Britain it is often a very common insect, and is fairly widely distributed, being recorded from twenty-six English counties, viz. all the coast counties from Lincs to Glo'ster except Dorset, together with Cheshire, Notts, Leicester, Rutland, Cambs, Worcester, Hereford, Monmouth, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in Ireland, but there are no records from Scotland. It will be seen, therefore, that the most northerly records for Great Britain are from Cheshire, Notts, and Carnarvon.

291. **Dichrooscytus rufipennis** Fall.

Fall. Hem. Suec., i, 92, 31 (1829); D. & S., B. H. 478 (1865); Saund., H.H.B.I. 247 (1892).

Ova. Unknown.

Larvae. Last instar, 4½ mm. Head and eyes large, the latter projecting far beyond anterior margin of pronotum; pronotum trapezoidal, rounded in front, and with posterior angles blunt. Head and pronotum bright green, the latter slightly rufescent posteriorly, with a paler longitudinal central line passing into scutellum which is dull green, more or less rufescent and with a curved pale line on each side; wing-pads bright crimson, with pale lateral margin, and infuscated posteriorly; abdomen dull green, slightly rufescent; connexivum well marked; hind margin of segments slightly rufescent; legs and antennae greenish, tibiae slightly infuscated, tarsi black, rostrum yellowish, dark at apex; fore parts with scanty dark pubescence; vertex glabrous, of a brighter green, longitudinally sulcated in centre; first tarsal joint very short, second very long, claws large.

Life-cycle. The imago has been found from June to early September, but specimens found in the two last-mentioned months show signs of wear. It matures in June, and usually does not last beyond July. The September record is continental.

Habitat, etc. In this insect we have again an arboreal species. It is found chiefly on *Pinus sylvestris*, to the green cones of which, according to Scott, it is especially attracted. But Reuter (19) mentions also several other trees on which it has been found, viz. *Abies excelsa, Juniperus communis, Quercus, Betula,* and *Salix,* and H. R. P. Collett has taken it on cypress.

Distribution. This insect is found chiefly in Central Europe and Scandinavia; it appears to be absent from the Mediterranean countries except the North of Italy, and from Russia except the extreme north-west; it extends northwards to Lat. 69°. In Britain it is recorded from twenty-one English counties, its occurrence naturally depending on that of its food-plant; these counties are the ten coast counties from Yorks to Devon, together with Cumberland, Lancs, Notts, Leicester, Hereford, Glo'ster, Bucks, Surrey, Berks, Wilts, and Somerset; the only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland.

291a. **Dichrooscytus valesianus** Fieb.

Fieb., E.H. 270 (1861); E.M.M., lvii, 30.

In coloration *D. valesianus* is a good deal like *D. rufipennis*, but it is much smaller. Head, pronotum, and scutellum yellowish-green, corium inwardly red and outwardly very pale yellowish-green, the two colours blending into one another, but the red becoming deepest just before cuneus, where it forms an indistinct fascia; clavus red at base and extreme apex and greenish between; cuneus greenish, more or less distinctly outlined with red and often with a fuscous dash just beyond its inner angle; membrane dark fuliginous and legs and antennae greenish-yellow, with apices of latter and of tarsi fuscous. Length barely 4 mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in July.

Habitat, etc. It lives on juniper.

Distribution. It is recorded from France, Spain, Switzerland, Greece, Algeria, and Tunisia. In Britain it has been taken in one locality only, viz. Goodwood, W. Sussex, where Mr. Philip Harwood took five specimens in July, 1919, while searching juniper bushes for the Pentatomid *Cyphostethus tristriatus.*

292. **Plesiocoris rugicollis** Fall.

Fall. Mon. Cim., 76, 30 (1807); Saund., H.H.B.I. 248 (1892).

Ova. Mr. J. C. F. Fryer, in a popular account of this and other apple pests, thus describes the eggs: "In shape they are elongate, and somewhat resemble the rubber portion of a fountain-pen filler or a soda-water bottle. They are about $\frac{1}{16}$ in. in length and are translucent white in colour, but are seldom likely to be observed owing to their situation," which is that they are laid beneath the bark of the twigs of the food-plant.

Larvae. "Nympha: Laete virescens, opaca, nuda, supra linea media corpus percurrente, plerumque etiam pronoto postice rudimentisque alarum, nec non basi lateribusque abdominis flavo-virescentibus, oculis dilute ferrugineis, tibiis nigro-punctatis, tarsis nigris" (Reuter, 2).

Life-cycle. The imago is found from June to September. There is something perplexing as to the season of this insect, and it almost seems as if there must be two broods during the summer. Those that are found in August are only just mature, in fact larvae may still be found at the beginning of the month, and this brood all mature much about the same time. The question is, therefore, whether the specimens that appear in June are the over-wintered autumn specimens of the previous year, or have been developed from larvae that have been hatched in the spring; in either case they will apparently be the parents of the autumn brood. According to Mr. J. C. F. Fryer, who speaks of this species as it occurs in orchards, the eggs are laid from the end of June to the beginning of August. They remain for the autumn and winter and hatch during the latter part of April in the next year; April 14th is the earliest date recorded. But in nature the course is different.

Habitat, etc. This species is attached chiefly to species of *Salix*, including even *Salix repens*, on which I have taken it abundantly on the sandhills of Carmarthenshire, at Kidwelly. Norman found it on *Myrica*, hazel, and "honey sallow." I took it also in Snowdonia on *Myrica*, and Mr. Collett has sent it me from the same plant in Westmorland. On the Continent it has been taken occasionally on *Alnus*. But a curious modification is taking place in some parts of Britain in the habits of this insect. The apple orchards in some parts of the country are being seriously injured by immense numbers of it, which pierce the young leaves and flower-buds, and so cause malformation or complete withering of the parts attacked; much fruit is thus irretrievably damaged or prevented altogether from developing; the specimens found in orchards on apple mature much earlier than those in the open on sallow. I have received this species from black currant, on which it was found together with *Orthotylus marginalis* by Mr. G. B. Routledge. If allowed to multiply it would no doubt be as destructive to this fruit as to apples.

It is often mistaken by beginners for *Orthotylus marginalis*, especially when the latter develops a yellow margin to the hemielytra, as it often does, but the presence of the pronotal collar and the irregularity of the pronotal surface should prevent this mistake.

Distribution. It is widely distributed in Europe, and extends its area into Algeria and Siberia, reaching in the latter the height of 69° N. lat. In Britain it is fairly generally distributed and common where it occurs. It is recorded from twenty-five English counties, viz. the coast counties from Suffolk to Glo'ster, together with Northumberland, Cumberland, Westmorland, Yorks, Lancs, Cheshire, Derby, Notts, Lincs, Cambs, Worcester, Hereford, Bucks, Surrey, and Wilts. In Wales I have found it in both

Carnarvon and Carmarthen, and Hallett has it from Glamorgan; it is recorded also from both Scotland and Ireland.

293. **Lygus pabulinus** Lin. (subg. Lygocoris, Osh. Cat.).

Lin., F.S. 974 (1761); D. & S., B.H. 457 (1865); Saund., H.H.B.I. 249 (1892).

Ova. Length about 1½ mm. Cylindrical, rather abruptly curved at the anterior end, broadest behind the middle, rounded posteriorly, truncate anteriorly; colour yellowish.

Larvae. The larva is green, and its form may perhaps be gathered from what Reuter (2) says of the genus *Lygus* as a whole: "Nympha imagini statura sat similis, pronoto margine postico distincte et late rotundato, rudimentis alarum sat latis."

Bright, delicate green, antennae and tibiae yellowish, apical joint of former slightly infuscated; tarsi smoky-black. Younger instar with legs almost entirely yellowish.

Life-cycle. The imago is found from May to October, the record for May being continental only.

Habitat, etc. It is found by sweeping amongst tall herbage, especially nettles. Reuter (2) gives the following additional plants: *Rubus idaeus*, *Chenopodium*, *Atriplex*, *Aspidium*, and J. Sahlberg *Spiraea ulmaria*. Dalla Torre adds alders and willows, but these as being trees seem rather questionable records for a species which is otherwise entirely addicted to low-growing plants; moreover, the alder has a special *Lygus* of its own, viz. *L. viridis*. I have taken *L. pabulinus* also on *Epilobium angustifolium*.

In the allotments in which potatoes were grown during the great European War it was found to do damage to these crops, and Mr. J. C. F. Fryer tells me it has greatly injured his dahlias. It has been found injuring pear trees in June. These specimens were rather smaller than usual. The pale spines on the tibiae are one of the most reliable features of this insect.

Distribution. This very common insect is found throughout almost the whole of Europe to 66°, as well as in Siberia, Central China, and North America. In Britain it is one of our most widely distributed insects, though perhaps not occurring in such great numbers as several other Hemiptera. It is recorded from thirty-two English counties, i.e. that is all except Staffs, Salop, Worcester, Rutland, Hunts, Beds, Northants, and Monmouth; the Welsh records are from the counties of Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

294. **Lygus contaminatus** Fall. (subg. Lygocoris Osh. Cat.).

Fall. Mon. Cim., 76, 29 (1807); D. & S., B.H. 459 (1865) (sulcifrons); Saund., H.H.B.I. 250 (1892).

Ova. Unknown.

Larvae. "Nympha: virescens, supra pilis brevissimis nigris, hinc inde pubescens ; abdomine glabro, basi puncto medio nigro, antice ochraceo, vel toto ochraceo, notato ; femoribus apicem versus punctis nonnullis nigris annulisque duobus anteapicalibus obsoletis fuscescentibus, tibiis nigro-punctatis et ferrugineo-spinulosis, tarsis nigris ; pedibus breviter sat dense nigro-pubescentibus ; antennis apicem versus fuscis " (Reuter,2). To this may be added that the apices of wing-pads and abdomen are usually more or less fuscescent, and that one or two stout, rather long, black setae are found on the inner side of the first antennal joint. The hairs on the legs are perhaps not quite so obvious as might be imagined from the above ; the point is that, unlike those of *L. pabulinus*, they spring from blackish spots, and are themselves tinged with ferruginous.

Life-cycle. The imago occurs from June to October. The larva is generally full grown by the middle of June.

Habitat, etc. This is an arboreal species ; it is found in this country, I believe, almost exclusively on birch. Reuter (12) records it also from alder and *Ulmus campestris* ; Carr gives *Pulicaria dysenterica* and *Salix*, Morley (4) *Tanacetum vulgare* in addition, and Routledge hazel. Horváth says it is found sometimes in autumn on conifers, and Reuter (19) took one specimen on *Picea excelsa* in October. If these are other than records of mere accidental occurrences, they suggest the possibility of a resort to the evergreen conifers for the purpose of shelter when the deciduous trees are losing their leaves, and possibly of a hibernation in such quarters ; but there are no records of spring specimens appearing, which would necessarily follow from any such hibernation, nor have specimens been found later than October.

The insect is often mistaken for *L. pabulinus*, but the differences which have already been pointed out in the hind tibiae of the larvae of the two species apply equally to the adults.

Distribution. It is found throughout the greater part of Europe, up to Lat. 66° 20 N., and also in Siberia, Algeria, and North America. In Britain it may be expected to occur wherever birch trees flourish, and it has been recorded from twenty-eight English counties, viz. all the coast counties from Durham round to Glo'ster, except Devon, and from Cumberland, Cheshire, Derby, Notts, Leicester, Cambs, Warwick, Worcester, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; in Wales the records are from the counties of Carnarvon and Glamorgan, and it is found in both Scotland and Ireland.

295. **Lygus viridis** Fall. (subg. Lygocoris Osh. Cat.).

Full. Mon. Cim., 85, 55 (1807) ; D. & S., B.H. 461 (1865) ; Saund., H.H.B.I. 250 (1892).

Ova. According to Leuckart, the egg is of the usual Capsid form with a well-developed collar at the anterior end. The description is the same as that of *A. seticornis* (q.v.), with the following modifications and additions.

The collar rises above the level of the lid ; micropyles twenty to twenty-five in number, in the usual position ; the collar flattened from side to side, and there widely excavated ; the entrance to the micropyles an elegant cylindrical cup ; the space within the collar filled with a honeycomb-like tissue of flattened columnar cells.

Larvae. Undescribed.

Life-cycle. The imago is found from June to September.

Habitat, etc. This insect seems to be rather more general in its feeding than the preceding. I have found it in its most typical form on oaks, somewhat sparingly ; but in a form which closely resembles *L. contaminatus*, having very little trace of the darkened clavus, I have taken it abundantly in S. Wales on alder. A few specimens had the normal coloration, but by far the greater number were of the variety which has the clavus not any more tinged with brown than *L. contaminatus*, which almost always has a slight suspicion of brown in that region ; it can, however, be distinguished by the smaller eyes, which are wider apart. Bold speaks of finding it on the flowers of Umbelliferae, and Carr on *Rhamnus frangula*, and Routledge on lime, and on the Continent Reuter (12) records it also from *Sorbus aucuparia* and *S. fennica*, *Spiraea salicifolia* and *Tilia ulmifolia*.

Distribution. It inhabits the greater part of Europe and is also found in N. America. In Britain it is less general than the preceding, or perhaps overlooked on account of its resemblance to *L. contaminatus*. It is recorded from twenty-two English counties, viz. the coast counties from Norfolk to Glo'ster, together with Northumberland, Cumberland, Yorks, Lancs, Notts, Hereford, Oxon, Bucks, Herts, Surrey, and Wilts ; the Welsh records are from Carmarthen and Glamorgan, and it is found in both Scotland and Ireland.

296. **Lygus limbatus** Fall. (subg. Lygocoris Osh. Cat.).

Fall. Mon. Cim., 85, 54 (1807) ; Saund., H.H.B.I. 251 (1892).

Ova. Unknown.

Larvae. " Nympha : Imagini colore simillima, virescens, glabra, antennis pedibusque omnino ut in imagine signatis, rudimentis alarum posterius nigricantibus " (Reuter, 2).

Life-cycle. The imago occurs from June to August.

Habitat, etc. This species inhabits sallows, and on the Continent occurs on *S. nigricans*, and *S. aurita*.

Four varieties are thus described by Reuter (12) :

> (*a*) Clypeo, pronoto postice magis minusve late, scutello, clavo toto, macula magna in angulo corii interno anguloque interiore cunei nigris. ♂ ♀.

(*b*) Ut praecedens, sed scutello macula utrinque basali apiceque ferrugineis. ♂♀.

(*c*) Pallide-virescens, pronoto postice minus late, scutello, macula basali utrinque apiceque exceptis, clavo tantum margine scutellari corioque macula rhomboidali minus lata in angulo interno posita fuscis. ♀.

(*d*) Pallide-virescens, solum clypeo, margine scutellari clavi apicem versus, maculaque hemielytrorum angulum interiorem corii et cunei occupante nigro-fuscis vel nigris. ♀.

Distribution. It inhabits Northern and Central Europe and its area extends into Siberia. In Britain it has been taken on one occasion only, by Messrs. E. and F. S. Saunders on Wimbledon Common in August, 1880.

297. **Lygus lucorum** Mey. (subg. Lygocoris Osh. Cat.).

Meyer, Caps., 46, 3, t. 6, fig. 2 (1843); D. & S., B.H. 458 (1865); Saund., H.H.B.I. 251 (1892).

Ova. The egg is of the usual Capsid shape, tubular, slightly curved, rounded posteriorly and truncated anteriorly. It is about 1 mm. long, and when taken from the ovary, of a pale greenish-yellow colour.

Larvae. Last instar, 3½ mm. Green, rather broad oval; head viewed from above broad, triangular, eyes projecting beyond anterior margin of pronotum; pronotum transverse, with angles rounded, posterior angles strongly so, posterior margin very slightly emarginate; body broadest a little before end of wing-pads; pubescence very slight; apices of tibiae and tarsi infuscate; spines on intermediate and posterior tibiae springing from black spots; rostrum reaching to intermediate coxae; a row of blackish setae on under side of anterior femora; last two antennal joints together subequal in length to second.

Life-cycle. The imago is found from July to October, and some of the larvae last up to the middle of August.

Habitat, etc. This insect is not arboreal, but frequents a number of low plants, only very occasionally occurring on trees. Reuter (12) gives the following list: *Urtica dioica*, *Artemisia campestris*, *A. vulgaris*, *A. absinthium*, *A. procera*, *Tanacetum vulgare*; Douglas and Scott add *Eupatorium cannabinum*. Blathwayt records it from oaks in July, and I have myself taken it on young bushes of Spanish chestnut growing in copses where the trees had been cut down. Parfitt also records it from brambles, Carr from *Spiraea ulmaria*, and I have found it on *Myrica gale*, and on *Artemisia absinthium* in North-east Yorkshire. The nettle is apparently the commonest food-plant. Though broader it is a more active insect than those species that are strictly arboreal.

Four varieties are described by Reuter (12):

(*a*) *maculata* Reut. (=nigronasutus Reut., nec. Stål). Clypeo nigro, clavo maculis nonnullis nigricantibus, corio vitta longitudinali prope suturam clavi, macula anguli exterioris et plerumque altera anguli interioris anguloque interiore cunei nigricantibus; pronoto saepe maculis quatuor obscurius viridibus vel subnigricantibus.

(*b*) *typica*: Clypeo nigro-fusco, hemielytris signaturis valde obsoletis, solum angulo interiore cunei fusco.

(*c*) Ut var. (*b*), sed etiam clypeo concolore.

(*d*) Clypeo hemielytrisque totis concoloribus.

Var. (*a*) I have taken at Corton, near Lowestoft. The *nigronasutus* of Stål is a different species, though closely allied, and distinguished from this by having the apex of the cuneus dark, and by having black spines springing from black points on the tibiae.

Its green colour is of a deeper tint than in the preceding three species.

Distribution. It is distributed over both the Palaearctic and Nearctic regions. In Britain it has a wide area, being recorded from twenty-four English counties, including the coast counties from Norfolk to Glo'ster except Dorset, and Northumberland, Cumberland, Yorks, Cheshire, Notts, Cambs, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from Carnarvon, Radnor, Brecknock, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

298. **Lygus spinolae** Mey. (subg. Lygocoris Osh. Cat.).

Mey. S.E.Z., 86 (1841); D. & S., B.H. 458 (1865); Saund., H.H.B.I. 251 (1892).

Ova. Unknown.

Larvae. I have larvae which may belong to this species. Last instar, 3½ mm. Broad oval, green, without markings and covered with scattered black setae; very similar to preceding, and with last two antennal joints together longer than second.

Life-cycle. The imago occurs from June to September, and is thus a little earlier than the preceding species.

Habitat, etc. This is another species devoted to low plants, such as nettles and thistles, especially the latter. Buchanan White found it on *Myrica gale*, and Morley (4) and Carr on sallow; Douglas and Scott (1) add brambles; Reuter (12) mentions also *Spiraea salicifolia*, *S. ulmaria*, and *Ceanothus americanus*. When in the net it can generally be distinguished superficially from *L. lucorum* by its paler colour, especially the cuneus, and by a very slight bluish tinge which it has when freshly disclosed. It is active like *L. lucorum*, and can always be easily distinguished by the small black spot at apex of cuneus. These last two green species are sometimes confused with the first three in the genus ; their shorter and broader form should be sufficient to prevent this.

Distribution. The European distribution of this species is similar to that of the preceding ; it occurs also in Siberia, Turkestan, and China, but not in North America. In Britain this is not so common an insect as the preceding ; it is recorded from only twenty-one English counties, i.e. all the coast counties from Norfolk to Glo'ster, together with Notts, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; the Welsh records are from Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in Scotland, but is not recorded from Ireland. Thus between the English and Scotch localities there is an enormous tract of country covering the whole of the northern counties of England, together with those Midland counties that lie north of a line running from the south of Salop to the southernmost corner of Lincs, with the single exception of Notts, from which this insect has not yet been recorded, although many of these counties have been well worked. But I find that collectors do not readily distinguish this species, and therefore it may often be passed over.

299. **Lygus pratensis** Lin. (subg. Lygocoris Osh. Cat.).

Lin., F.S. 949 (1761) ; D. & S., B.H. 463 & 464 (1865) (inc. v. campestris) ; Saund., H.H.B.I. 252 (1892).

Ova. Unknown.

Larvae. "Nympha : Supra glabra vel subglabra, sordide virescens vel testacea, pronoto rudimentisque alarum plus minusve fulvescentibus vel rufescentibus, interdum tamen totis virescentibus, antennis apicem versus femoribusque annulis duobus apicalibus fuscescentibus vel obscure fulvis, tibiis apice tarsisque nigris ; pro-, meso-, et metanoto disco utrinque puncto nigerrimo notatis, hoc in metanoto minus distincto, minusculo, rudimentis alarum plus minusve fuscescenti-, fulvo-, vel testaceo-variegatis, striolis saepe plus minusve angulatis fulvis vel nigricantibus notatis ; puncto dorsi abdominis mox pone basin nigerrimo ; dorso vittis quinque longitudinalibus plus minusve distinctis sordide albidis vel glaucis vel marinis (Reuter, 2).

Nymph of *Lygus pratensis* L.

The 3½ pairs of very black dots indicated above, or perhaps one should say 2½ pairs, as the minute ones on the metanotum easily escape notice, are usually sufficient to enable this most variable larva to be recognised.

Life-cycle. The imago occurs practically all the year round, and I have definite records for every month except March and December. As the insects of the year mature at the beginning of August, it is evident that those met with in the earlier months are over-wintered specimens, so that the period of duration for the perfect insect is, in some cases at least, close upon a twelvemonth ; it is probable, however, that the majority die in the autumn, leaving only the remainder to pass over into the next year. Whether those that die in the autumn leave any posterity by an autumnal oviposition, or whether the perpetuation of the species is dependent entirely upon those that survive the winter, and then, it may be presumed, oviposit in the spring, or finally whether all oviposition is done in the autumn, and the over-wintered specimens have no reproductive function in the spring : these are questions to which no answer can at present be given. All that can be said is that *L. pratensis* is one of the few *Capsidae* that do really survive the rigours of winter, and that the great number of specimens of it that occur suggest that every possible opportunity is taken for oviposition.

Habitat, etc. This species occurs abundantly amongst grasses and other low plants, but it does not seem to be associated with any one species of plant more than another. It is sometimes found abundantly on the flowers of various species of *Senecio*, and also amongst nettles. The late Rev. E. A. Woodruffe Peacock furnished me with a list of seven plants on which he found it with pollen grains attached, so that it may be an agent in the cross-fertilisation of plants ; the list is as follows : *Eranthis lugernalis* (garden plant), *Achillea millefolium*, *Raphanus raphanistrum*, *Tanacetum vulgare*, *Antirrhinum majus*, *Polygonum sp.*, *Leontodon autumnalis*. Reuter (12) gives also red currant and gooseberry, *Cirsium*, grasses, and *Compositae* as associated with it. He adds that the var. *punctatus* is taken on *Calluna*, and var. *gemellatus* on *Artemisia*. J. E. Mason (1) records a reddish var. as occurring on larch, and the var. *punctatus* was taken in Scotland by Norman on *Pinus sylvestris*. Reuter (19) also gives several instances of its having been beaten in winter from *Pinus sylvestris*, *Picea excelsa*, and *Abies*, coniferous trees to which it had retired for the purpose of hibernation. Morley found it in moss in spring. It would be difficult, indeed, to mention any plant on which or any place in which, it might not be expected to occur. Bueno records its being taken at light. It is common in gardens, on all kinds of garden produce. Howard says that in America, where it is called the "Tarnished Plant-Bug," it is present in all flower and vegetable gardens, and he accuses it of causing what is called the "buttoning" of strawberries. It is also troublesome there to fruit trees, attacking the leaves of quince, apple, plum, and cherry.

The variation in colour seems to have some reference to food- (or should it be host- ?) plant, as witness the pale vars. on *Senecio*, the reddish form on larch, etc. It is certainly the most variable of all British Heteroptera ; the variations occur, not merely in colour, but also in size and in depth and degree of puncturation, and yet there is something about its appearance which makes it always easily recognisable. Of course, there remains the question whether these so-called variations are really such or whether they represent different species. The only way in which this question can be answered is that of repeated breeding on a considerable scale ; if they were found to " breed true " they might fairly be regarded as specifically distinct. But, unfortunately, no such experiments have hitherto been possible.

Reuter describes at some length the following six forms which he scruples to call varieties, and which may in fact turn out to be distinct species.

(*a*) *punctatus* Zett. superne sub-glaber vel breviter parce flavicanti-pubescens, punctis magnis profunde minus dense impresso-punctatus, ferrugineo-testaceus, inferne saepissime nigro-vel ferrugineo-variegatus; pronoto disco medio plagis quatuor ferrugineis plagas tres pallidas includentibus, interdum obsoletis, callis totis vel lateribus maculisque quatuor pone eos subquadrangularibus nec non macula angulorum posticorum nigro-piceis; scutello flavo-testaceo, basi striis duabus mediis saepe confluentibus nigris vel ferrugineis; hemielytris clavo plaga media corioque fascia apicali angulata ferrugineis vel fuscis, cuneo angulis interioribus apiceque ferrugineis vel apice piceo; membrana venis testaceis vel ferrugineis, areolis apice late nigro-fuscis, macula ante medium marginis exterioris pellucida, antice et postice late nigricanti-terminata, marginibus apicali et interiore latissime arcuatim nigricantibus; pronoto plerumque remote, hemielytris paullo densius punctatis. ♂ ♀. Long. 6½–7¼ mm. (This form occurs on *Calluna vulgaris.*)

(*b*) *rutilans* Horv.: superne sub-glaber, rufo-ferrugineus, capite excepto ubique fortiter sat remote impresso-punctatus, corio apicem versus cuneoque paullo obsoletius punctatis, pronoto antice inter callos flavicante, callis posterius extusque late nigroterminatis; scutello vittis duabus apicem versus convergentibus apiceque flavicantibus, basi ima medio nigro; hemielytris totis rufo-ferrugineis, cuneo apice concolore, membrana fusco-hyalina, venis rufo-ferrugineis; pectore, ventre femoribusque magis minusve nigro-variegatis; hemielytris et pronoto fere aeque dense punctatis. Long. ♀ 5½ mm.

(*c*) *gemellatus* H.S.: superne glaber, pallide grisescenti-virescens, numquam rufescens, capite excepto remote sed fortiter impresso-punctatus, hemielytris pronoto vix vel parum densius punctatis; pronoto innotato vel punctis duobus ad marginem posticum callorum interdumque macula angulorum basalium nigris; scutello flavo, basi medio saepeque vittula utrinque angulorum basalium nigris; hemielytris plerumque innotatis, interdum parce fusco-variegatis, apice cunei fusco; membrana subhyalina, venis pallidis. ♂ ♀. Long. 6–6¾ mm.

(*d*) *campestris* Fall.: praecedentibus minor, pronoto sat remote fortiter impresso-punctato, subglabro, scutello obsoletius punctato, hemielytris dense sat subtiliter punctatis, scutello et praecipue hemielytris distincte griseo-sericeopubescentibus; superne grisescens vel griseo-virescens, pronoto innotato vel vittis longitudinalibus fuscis, griseis vel flavescentibus variegato, interdum etiam macula utrinque angulorum posticorum nigra; scutello saepe nigro, macula basali utrinque apiceque nec non saepe linea longitudinali flavis, rarissime toto nigro (♂) vel flavo, basi vittis duabus magis minusve dilatatis nigris (♀) hemielytris magis minusve dense nigricanti vittulatis, corii maculis postice saepe in fasciam confluentibus, cuneo apice concolore vel angustius nigro-fusco ; membrana nigricante venis saepe ad partem fuscis, areolis apice excepto, macula limbi exterioris ante medium discoque plerumque hyalinis. Long. 5–6 mm. Douglas and Scott say that this var. occurs on flowers of furze and at roots of heath.

(*e*) Ut praecedens, sed superne fusca, solum vertice, maculis quinque discoidalibus pronoti, punctis utrinque apiceque summo scutelli nec non cuneo, basi apiceque exceptis, ferrugineis, inferne ferrugineo-fuscoque variegata ; antennis nigris, articulo primo fusco, secundo basi apiceque exceptis ferrugineo. ♂ ♀. Long. 5 mm.

Distribution. This is one of the most widely distributed species in the whole of the *Capsidae*, occurring over the entire Palaearctic Region, and over the American Continent as far south as Mexico and Guatemala. According to Reuter, the var. *punctatus* occurs in the northern and alpine part of Palaearctica, and the var. *rutilans* in the Tyrol. In Britain *L. pratensis* has a wider area than any other Capsid and, indeed, is probably universal in its occurrence. It is recorded from thirty-two English counties, the exceptions being Salop, Staffs, Derby, Rutland, Hunts, Beds, Northants, Monmouth ; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland. It is a species which is evidently possessed of great plasticity, as is shown by its great variability, its wide geographical range, and its great variety of host-plants. If, as appears probable, it is a carnivore as well as a vegetarian in diet, this would be a further evidence of its adaptability and a guarantee of its survival.

300. **Lygus rubricatus** Fall. (subg. Lygocoris Osh. Cat.).

Fall. Mon. Cim., 91, 70 (1807) ; D. & S., B.H. 462 (1865) ; Saund., H.H.B.I. 254 (1892).

Ova. Length about $\frac{3}{4}$ mm. Cylindrical, truncated anteriorly, rounded posteriorly ; straight on one side, convexly rounded on the other ; bent anteriorly towards the straight side ; collar moderate ; the truncation of this end oblique ; colour shining yellow.

Larvae. " Nympha : virescens, imaginis statura, femoribus posticis apicem versus rubris " (Reuter, 2).

To this may be added, last instar, 3 mm., often more or less ferruginous, with the head and basal joint of antennae more or less tinged with red ; pronotum very transverse with hind margin indented in the middle ; apex of tarsi black ; the fore parts furnished with a very short and scattered, almost imperceptible pubescence ; rostrum stout, and extending beyond posterior coxae.

Life-cycle. The imago is found from June to September. Though living naturally on coniferous trees, which afford such excellent winter-quarters for many species that are not ordinarily attached to them, this species does not hibernate, but dies in the autumn, so that its life as a perfect insect does not last more than three or four months.

Habitat, etc. This is an exclusively arboreal species, frequenting coniferous trees, occurring with us chiefly on *Pinus sylvestris* ; Reuter adds the following *Coniferae*, *Picea excelsa*, *Abies alba*, *Pinus montana*, *Larix europaea*. It shows considerable variability in the intensity of its coloration, a variability which is not due merely to varying degrees of hardening of its chitin. Reuter mentions five varieties as follows :

> (*a*) Capite, pronoto scutelloque obscure piceis, strictura apicali et margine basali pronoti apiceque scutelli pallide flaventibus ; clavo corioque picescenti-rufescentibus, corio apice piceo.
>
> (*b*) Ut praecedens, sed hemielytris flavo-testaceis vel ochraceis margine laterali maculaque apicali corii piceis vel fuscis, cuneo apice piceo-sanguineo.
>
> (*c*) Ut praecedens, sed capite et pronoto testaceis, illo lateribus late piceis.
>
> (*d*) Superne tota flavo-testacea vel ochracea, solum apice cunei sanguinea.
>
> (*e*) *löwi* Reut : superne tota pulchre chermesino-rubro, levius nitida, cuneo apice concolore, venis membranae sanguineis.

Distribution. This is obviously dependent upon that of the food-plants, and yet it is not strictly conterminous with these. It is found over the whole of Europe ; it occurs also in Persia and Algeria. In Britain it is recorded from twenty-one English counties, viz. Cumberland, Durham, Yorks, Notts, Leicester, Norfolk, Suffolk, Hereford, Oxon, Bucks, Herts, Middlesex, Kent, Surrey, Sussex, Berks, Wilts, Dorset, Somerset, Devon, and Cornwall. There are some curious omissions here. The only Welsh record is from Glamorgan. It is found in both Scotland and Ireland.

301. **Lygus atomarius** Mey. (subg. Lygocoris Osh. Cat.).

Mey. Caps., 73 (1843) ; Saund., H.H.B.I. 255 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from August to October and also in April.

Habitat, etc. This again is an arboreal species confined to coniferous trees. It has been found with us on silver fir, and Reuter gives *Pinus strobus*, *Abies excelsa*, and *A. pectinata*.

It is a variable insect, and Reuter describes the following varieties :

> (*a*) Capite piceo (♂) vel testaceo vertice nigromaculato (♀), pronoto,

scutello, hemielytrisque ubique maculis fuscis vel nigricantibus irroratis; scutello maris vitta media nigricante. ♂ ♀.

(*b*) Capite piceo (♂) vel testaceo, vertice maculis duabus vel quatuor piceis (♀), pronoto, scutello hemielytrisque testaceis, scutello maris vitta media fusca; clavo vitta ad suturam clavi, corio vitta anguli interioris apicalis maculisque duabus in angulo exteriore apicali nigricantibus. ♂ ♀.

(*c*) Ut praecedens, sed hemielytris signaturis totis destitutis, membrana maculis cinereis obsoletis. ♀.

Distribution. It is found in Central and Southern Europe, together with Asia Minor. In Britain it has occurred in Norfolk, where a colony was discovered by Mr. J. Edwards at Stratton Strawless, in Suffolk, from which county I received a specimen from Mr. W. H. Tuck, taken at Tostock, and in Ireland, recorded by Mr. J. N. Halbert. No other records are forthcoming.

302. **Lygus cervinus** H.S. (subg. Lygocoris Osh. Cat.).

H.S. Wanz., vi, 57, fig. 617 (1841); D. & S., B.H. 454 (1865); Saund., H.H.B.I. 254 (1892).

Ova. Unknown.

Larvae. Last instar, 3 mm. Greenish testaceous, often with apex of wing-pads more or less fuscescent; sometimes with reddish markings, especially on abdomen, where they appear as three more or less irregular longitudinal bands, one central and two lateral; hind femora with reddish apical rings; pronotum very transverse, with hind margin rounded; wing-pads long, extending half-way down abdomen; apex of tarsi fuscous. When dried this larva is much like that of *L. rubricatus*, but the latter has more slender antennae, with the last two joints rather longer.

Life-cycle. The imago occurs from May to September, and it has also been taken in November; the insects of the year mature for the most part at the beginning of August or the end of July.

Habitat, etc. This, again, is chiefly an arboreal species; it frequents a variety of trees, such as lime, ash, hazel, of which lime appears to have the preference. J. E. Mason records it from hawthorn and sloe; I have taken it also rather commonly on ivy in Surrey, on box at Box Hill, and occasionally by sweeping heath; Carr records it from *Quercus*, *Salix*, and *Rubus*. Reuter adds *Onobrychis sativa*, *Lonicera xylosteum*, *Althaea officinalis*, *Salix cinerea*, *Sorbus aucuparia*, *Abies pectinata*, and *A. alba*. According to Horváth it is rare on Coniferae, but Morley has found it on firs at Foxhall, Suffolk. Parfitt mentions taking it on ferns, and Dalla Torre gives *Scabiosa columbaria*.

It varies a good deal in both depth of coloration and size. Reuter describes four varieties thus :

> (*a*) Clypei apice, callis limboque basali pronoti, margine albicante excepta, vittis duabus scutelli, clavo medio magis minusve late ipsoque apice, fascia lata apicali corii nigro-fuscis vel fuscis ; cuneo apice sat late margineque interiore tenuius fusco-sanguineis.
>
> (*b*) Ut var. (*a*), sed callis pronoti clavoque concoloribus, hoc solum margine scutellari ipsoque apice fuscis.
>
> (*c*) Pronoto toto concolore vel puncto fusco utrinque ad angulum basalem ; signaturis hemielytrorum dilutius rufescentibus.
>
> (*d*) Superne pallide flavens, scutello apiceque cunei testaceis, illo vittis destituto, apice pallido.

Var. (*a*) does not seem to be common with us, but I have a small specimen which almost entirely agrees with it, and which was taken near Bury St. Edmunds by Mr. W. H. Tuck.

Distribution. *L. cervinus* extends over Europe and Central China as well as in Teneriffe and Algeria. In Britain it occurs quite widely, being recorded from thirty English counties, viz. all except Lancs, Staffs, Salop, Worcester, Rutland, Hunts, Beds, Northants, Monmouth, and Berks ; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

303. **Lygus viscicola** Put. (subg. Orthops Osh. Cat.).

Put. Rev. d'Ent., 365 (1888) ; Saund., H.HB.I. 252 (1892).

Ova. Length a little over ½ mm., greenish-yellow, short, rather broad and nearly straight, with the collar not projecting, the rim being very narrow.

Larvae. Last instar, 2¾ mm. Green, with wing-pads more or less red ; femora, especially hind pair, bright red ; shape very similar to that of preceding.

Life-cycle. The imago occurs in August and September, maturing about the beginning of the former month.

Habitat, etc. This insect inhabits mistletoe exclusively, on which it is accompanied by *Psylla visci* in great numbers and by *Anthocoris visci*, occasionally. The *Psylla* is undoubtedly a parasite on the plant, and the *Anthocoris* may be presumed to prey upon the *Psylla* ; the question remains what relation, if any, the *Lygus*, the largest of the three, bears to the others ; it is probably quite independent of them, occupying itself solely with the juices of the plant.

Distribution. This insect seems to be unknown outside the limits of England and France. In our own country it was first noticed in the orchards of Herefordshire, where it is abundant on the mistletoe that flourishes so well on the older trees; it has been taken also in Notts, Norfolk, Kent, Dorset, and Devon, but there are no British records outside the limits of these six English counties.

304. **Lygus pastinacae** Fall. (L. campestris L. (Reut.), subg. Orthops Osh. Cat.).

Fall. Mon. Cim., 86, 57 (1807); D. & S., B.H. 455 (1865); Saund., H.H.B.I. 253 (1892).

Ova. Length, $\frac{2}{3}$ mm. Cylindrical, nearly straight, truncated anteriorly, rounded posteriorly; shining yellow.

Larvae. "Larva tota virescens." (Fallén.)

Last instar, 3 mm. Entirely pale green, with a faint reddish stripe down the middle of the abdomen, and a still fainter one on each side; a minute black spot at base of third abdominal segment; tarsi black at base and apex. Head triangular; pronotum trapezoidal transverse, with rounded angles; wing-pads extending a little beyond the level of the black spot; fore parts with a few very short black hairs; body widest in middle; outline oval.

Life-cycle. The imago is found from May to October. There is a probability that it hibernates as imago.

Habitat, etc. This insect is very faithful in its devotion to the flowers of Umbelliferae, especially those of *Pastinaca sativa*, on the broad white umbels of which it makes a striking object, especially when, as often happens, several specimens are present together. Morley has found it on *Angelica* and *Choerophyllum*, and Carr on *Conium maculatum*. Reuter adds *Anethum graveolens*, *Athamas*, *Tamarix*, and *Urtica cannabina*. J. E. Mason found it on *Pinus sylvestris* in July, but these were apparently merely odd specimens.

The insect is a most variable one, and Reuter describes the following varieties:

(*a*) Capite, pronoto et hemielytris pallide ochraceis vel lurido-flaventibus, colore parum in viridem vergente, capite solum litura verticis vel etiam apice clypei, pronoto fascia per callos ducta vel solum marginibus posticis callorum fasciaque basali irregulari, interdum cum callis vittis duabus longitudinalibus conjuncta, hemielytris margine scutellari commissuraque clavi, corio macula media apicali apiceque cunei anguste fuscis vel cuneo fere concolore; scutello sulphureo; margine corii concolore; inferne sulphurea, solum mesosterno piceo.

(*b*) Viridis, capite pallidiore, margine verticis ante carinam, litura subcruciata superiore frontis, apice clypei, pronoto marginibus callorum magis minusve late, saepe macula utrinque basali ad angulos posticos, clavo interne, macula apicali corii apiceque cunei nigro-fuscis; inferne fusco-nigra, marginibus pectoris, orificiis, medio margineque tenui ventris sulphureis; margine laterali corii interdum obscure et saturate viridi, non tamen nigro.

(*c*) Ut var. *typica*, sed capite solum litura verticis apiceque clypei, pronoto solum marginibus posterioribus callorum piceis; pectore abdomineque totis virescentibus, solum mesosterno piceo. ♀.

(*d*) Tota virescens, colore fusco obsoletissimo, dorso abdominis virescente, basi vittisque tribus nigricantibus.

There is also a smaller yellowish var. found in Algeria. Some of the ♀♀ of this insect especially of var. (*a*), greatly resemble those of *L. Kalmii*, and their separation is not always easy.

Distribution. This insect occurs throughout the whole of Europe up to Lat. 65° N., and inhabits Algeria and N. America also. In Britain it is widely distributed, being recorded from twenty-seven English counties, viz. all the coast counties from Northumberland to Glo'ster except Durham, together with Lancs, Cheshire, Notts, Leicester, Cambs, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; in Wales the records are from Carmarthen and Glamorgan, and it is found in both Scotland and Ireland.

305. **Lygus Kalmii** Lin. (subg. Orthops Osh. Cat.).

Lin., F.S. 948 (1761); D. & S., B.H. 452 (1865); Saund., H.H.B.I. 253 (1892).

Ova. Unknown.

Larvae. "Nympha: sordide virescens, subtiliter et breviter nigropilosula, capite, pronoto, stria media angusta (in medio disci dilatata) lateribusque exceptis, scutello basi macula triangulari, rudimentis alarum postice nigricantibus maculis nonnullis indeterminatis, saepe valde extensis, nec non abdominis dorso vittis longitudinalibus quinque sat latis, quarum externo latissima,—fulvescentibus; abdominis dorso basi puncto nigro; corpore subtus virescente, pectore lateribus fulvo-maculato, ventre lateribus apiceque fulvis; interdum tota virescens, alarum rudimentis postice nigricantibus; femoribus posticis annulis duabus fulvis, tibiis tarsisque ferrugineis, his nec non rostro apice nigris" (Reuter, 2).

Life-cycle. I have records for this insect from May to October, and according to Reuter it hibernates as imago. As the insects of the year mature about the end of July or beginning of August, those met with in spring and early summer must be over-wintered examples.

Habitat, etc. It is found on nettles and *Umbelliferae* chiefly, but at any rate almost exclusively on low herbage. Carr mentions *Conium maculatum* and *Rubus*. There are, however, a few records from trees; J. E. Mason gives beech and hawthorn, and Carr elm and *Salix*. Parfitt took it by sweeping heaths, and Reuter quotes instances of its being found in winter in moss and by beating conifers. Woodruffe Peacock found a specimen on fennel carrying pollen grains, so that it may sometimes be an agent in the cross-fertilisation of plants.

It is a most variable insect, and Reuter enumerates ten varieties as follow:

(*a*) *picea* Reut. Superne nigra, solum verticis margine maculaque media, strictura apicali pronoti, macula obsoleta corii ante medium, arcuque basali cunei piceo-testaceis ; scutello apice sulphureo ; inferne piceo-nigra, marginibus prostethii, orificiis ventreque medio sulphureis ; antennis, tibiis tarsisque totis piceo-nigris, femoribus sulphureis, anterioribus annulis duobus apicalibus nigricantibus, posticis dimidio apicali nigro-piceis, apice annuloque anteapicali flavicantibus.

(*b*) *flavovaria* Fabr. Superne piceo-nigra, capite vel solum vertice postice guttaque obsoleta utrinque ad basin clypei, pronoto macula utrinque laterali et saepe etiam vittula angusta media, nec non margine basali, clavo macula ante apicem, corio basin versus magis minusve late cuneoque arcu basali fulvo-testaceis, dilute ferrugineis vel sordide stramineis, strictura apicali pronoti apiceque scutelli pallide flavis, scutello saepe etiam lateribus testaceis, rarissime fere toto flavo, solum macula parva basali triangulari ; inferne piceo-nigra, marginibus pectoris, orificiis vittaque utrinque laterali ventris pallide sulphureis, raro ventre ad magnam partem, lateribus exceptis, sulphureo.

(*c*) *thoracica* Westh. Ut praecedens, sed magis rufescenti-picea, pronoto utrinque macula laterali magna vittulaque media testaceis ; clavo et corio juxta suturam clavi, hoc etiam plerumque limbo toto externo testaceis ; cuneo dimidio basali testaceo, angulo interiore tamen piceo ; scutello testaceo apice flavo vel toto flavo, semper tamen basi macula triangulari piceo-nigra.

(*d*) Ut praecedens, sed pronoto dimidio apicali, strictura annuliformi excepta, vel fascia antica per callos ducta maculaque utrinque ad angulum basalem nigro-piceis.

(*e*) *fieberi* Westh. Pronoto fuscescenti-flavo, antice macula magna postice bilobata nigra, pone eam medio vitta albida, angulis basalibus nigris ; scutello nigro, angulis basalibus apiceque late flavis ; clavo sordide albido flavente, vitta obliqua ad angulum scutellarem commissuraque fuscis ; capite pallide flavente, vittis duabus nigricantibus.

(*f*) *pauperata* H.S. Capite nigro, solum postice testaceo, pronoto hemielytrisque sordide pallide lurido-testaceis, illo fascia per callos ducta nigra, interdum etiam utrinque ad angulum basalem macula nigra, his margine scutellari commissuraque clavi fuscis, corio macula obsoleta apicali media apiceque cunei obsolete ferrugineis vel fuscescentibus ; scutello flavo, macula basali majore fusca.

(*g*) *pellucida* Fieb. Capite nigro, solum postice testaceo, vel testaceo, maculis frontis clypeoque nigris vel piceis ; pronoto hemielytrisque sordide fuscescenti-virescentibus, illo callis postice vel totis, his margine scutellari et commissura cunei piceis, corio macula apicali saepe obsoletissima cuneoque apice sat obsolete fuscis ; scutello flavo, macula picea parva vel mediocri.

(*h*) *orientalis* Reut. Superne pallide grisescenti-ochracea, clypeo, marginibus lorarum, interdum vitta media frontis, pronoto fascia per callos aliaque limbi basalis, clavo margine scutellari commissuraque, corio macula anguli apicalis *exterioris* cuneoque apice nigro-piceis ; scutello sulphureo, macula minuta basali vel solum margine basali nigro ; pectore ventreque nigro-piceis, illo marginibus orificiisque, hoc medio late flavis.

(*i*) Ut praecedens, sed capite solum apice clypei marginibusque lorarum, pronoto solum macula utrinque ad angulum posticum nigris ; hemielytris ut in praecedente ; inferne sulphurea, solum mesosterno medio maculaque basali ventris pone coxas nigro-piceis ; antennis nigris, articulo primo superne testaceo.

(*k*) *frenata* Horv. Ut praecedens, saepe virescenti-lutea vel flava ; pronoto fascia basali hic illic interrupta nigra vel solum utrinque puncto intramarginali humerali nigro, hemielytris totis unicoloribus, solum ipso margine laterali nigro.

Some of these varieties closely approximate in coloration to those forms of *L. pastinacae* ♀ which develop very little of the beautiful green colour that is typical of the species ; but I believe *L. kalmii* can generally be distinguished by its narrower form and its rather differently shaped thorax. There is not usually any difficulty about the ♂, which is always narrower and longer than that of *L. pastinacae.*

Distribution. It occurs throughout the whole of the Palaearctic Region up to Lat. 63° N. In Switzerland it rises to 3000 feet, and in the Tyrol to 5000 feet. The var. *picea* is found in Germany, and the vars. *orientalis* and *frenata* in Turkestan and Transcaucasia. In Britain it is very common and probably quite generally distributed, being recorded from twenty-eight English counties, viz. all the eastern and southern coast counties from Northumberland to Glo'ster, together with Cumberland, Westmorland, Notts, Cambs, Northants, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; the Welsh records are from Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

306. **Lygus rubicundus** Fall. (subg. Orthops Osh. Cat.).

Fall., Hem. Su. Linn., 92 (1758) ; E.M.M., 1, 283.

L. rubicundus may be easily distinguished from the other British *Lygi* by its robust and rather broad form, and the extreme shortness of the antennae. The following description will suffice for its recognition.

Oblong oval, with pronotum strongly convex ; rather shining reddish ochreous, often more or less tinged with fuscous ; pronotum, scutellum, and hemielytra closely and finely punctured, and thickly covered with fine pubescence ; scutellum transversely finely striate ; extreme apex of cuneus dark ; membrane smoky with darker markings, cell-nerves reddish-yellow ; antennae with basal joint rather stout, second joint much shorter than is usual in *Lygus*, only slightly longer than width of head, including eyes, third and fourth joints subequal in length, the two together about as long as second ; legs and antennae reddish-yellow, posterior femora with two indistinct reddish rings ; anterior tibiae without outstanding spines, the others with pale spines ; terminal tarsal joint dark at apex, claws reddish ; rostrum dark at apex, just passing intermediate coxae. Length, 5 mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in August and October, and also in spring. According to Reuter it hibernates as an imago, and there are records for May and June.

Habitat, etc. As food-plants, or possibly host-plants, Reuter gives *Salix*, *Alnus*, *Quercus*, *Prunus padus*, *Corylus*, especially the first-mentioned. He also states that this is one of the species that leave their food-plants when the leaves fall, in order to hibernate in coniferous trees or elsewhere. According to Flor, it is found also in meadows and on heaths. The English specimens were found in October by sweeping in a ditch of mixed herbage, and by searching at the bottom of a bare hedge and amongst dead leaves. The insects were evidently preparing for hibernation. The species has several varieties, which are thus described by Reuter :

> (*a*) Superne flavicanti-rufescens, inferne flavicans unicolor ; annulis femorum obsolete ferrugineis. ♀.
>
> (*b*) Superne obscurius rufescens vel rufo-ferruginea, capite, pronoto apice, linea media longitudinali margineque basali, scutello linea media vel saltem apice flavicantibus ; inferne flavicans, rubro-variegata, mesosterno nigro ; antennis basi et apice articulorum secundi et tertii quartoque toto nigris ; femoribus annulis anteapicalibus obscure rufo-ferrugineis, tibiis margine superiore paullo pone basin vitta, tibiarum anteriorum longius prolongata, posticarum brevi, obscure ferruginea ; apice tibiarum et tarsorum fusco-nigro.
>
> (*c*) Ut praecedens, sed capite flavicante, apicem versus ferrugineo- et nigro-maculato, pronoto ad angulos anticos et posticos ferrugineo-fusco vel nigro, scutello basi vittisque duabus nigris, hemielytris magis minusve fusco-variegatis, clavo semper apice, pectore etiam lateribus nigro-, fusco-, et ferrugineo-variegato ; ventre medio fusco ; antennis articulis duobus ultimis totis nigro-fuscis ; femoribus etiam basin versus fusco-ferrugineis, annulis anteapicalibus fuscis, tibiis superne a basi vitta longa ferrugineo-fusca. ♂ ♀.
>
> (*d*) Ut praecedens, sed pronoto etiam utrinque pone callum macula vel vitta fusca ; scutello fusco, solum apice, linea media longitudinali tenui maculisque nonnullis basalibus flavicantibus, clavo dimidio basali et ipso apice corioque ad magnam partem fuscis vel fusco-rubiginosis. ♂ ♀.

Distribution. It is found in the whole of Europe up to Lat. 68° 30′ N., in

Siberia and North Mongolia, and in Algeria. According to Horváth it occurs also in N. America. The British specimens have been taken in one locality only, at Holwoods, Hunts, on the borders of Cambridgeshire, where it was originally, in 1913, and is still taken by Mr. H. Fortescue Fryer.

307. **Camptozygum pinastri** Fall.

Fall., Mon. Cim., 95, 79 (1807) ; Saund., H.H.B.I. 255 (1892).

Ova. Length, a little over 1 mm. Very pale yellowish ; cylindrical, curved, rounded posteriorly, anteriorly rather suddenly narrowed before the collar, which itself is of uniform depth and projects throughout beyond the level of the sides of the egg.

Larvae. Reuter gives the following description of the full-grown larva of the form of this insect that is found in Finland, which is much darker than those that usually occur with us. " Nympha rufo-picea, capite, litura media maculisque nonnullis lateralibus exceptis, pronoto limbo antico angustius limboque postico ultra medium albido-testaceis ; dorso abdominis transversim albido-lineato ; antennis testaceis articulo primo basi et apice rufo-piceis."

The following is a description of larvae which I took at Burnham Beeches and which would have produced the testaceous form that is the ordinary one with us : Last instar, 2¾ mm. Head testaceous, often marked with reddish and with an undefined central black line ; pronotum ferruginous in front with the callosities more or less darkened, sometimes almost black, hinder part testaceous with black margin, the contrast of colours being very marked and attractive ; wing-pads deep reddish testaceous, becoming black at the apex ; abdomen reddish with a deeper shade along the anterior margin of each segment ; legs reddish testaceous, with femora spotted, and tibiae dark at apex and narrowly so at base, tarsi infuscated at base and apex; antennae testaceous, the two basal joints rather stout. It is a very striking-looking insect.

Life-cycle. The imago occurs from the end of June to September. The above larvae were found on June 22nd and would probably have made their final moult in a few days.

Habitat, etc. Strictly speaking, this insect is confined to coniferous trees, and chiefly Scotch fir, though it has occurred on larch (Gredler) and juniper (Schouteden). Morley has recorded it from *Melilotus officinalis*, but this can hardly be other than an accidental occurrence. Reuter gives *Pinus sylvestris* and *P. austriaca*.

On the Continent it varies a good deal in intensity of coloration, some specimens being even black. In this country it is rarely anything but testaceous. Reuter says that in S. Finland he only once took an ochreous example, all the others being black, and speaking of his experience when he visited Scotland and collected at Forres, he suggests that, as the ochreous specimens resemble in colour the scales of the young shoots of the firs, the ochreous colour may be protective, and there may exist in N. Scotland some enemy to *C. pinastri* which does not occur in S. Finland, so that only the individuals favoured by protective resemblance remain and propagate.

The varieties are described by Reuter as follows :

(*a*) Nigra, capite, medio striisque apicalibus exceptis, flavotestaceo ; commissura clavi arcuque cunei basali fusco-testaceis. ♂♀.

(*b*) Nigro-picea, capite ut in var. (*a*), hemielytris obscurius flavotestaceis, margine laterali, fascia lata apicali corii cuneoque nigro-piceis, hoc basi, angulo interiore excepto, testaceo. ♂.

(*c*) Ut var. (*b*), sed pronoto parte apicali, strictura excepta, nigropicea, fascia apicali corii minus lata ; scutello piceo.

(*d*) *maculicollis* M. & R. Superne flavo-ferruginea vel ochracea, pronoto fascia apicali vel solum callis nigro-piceis, cuneo apice picescente, scutello corioque apicem versus magis minusve ferrugineis, illo basi saepe nigro ; inferne testacea, plerumque mesosterno ad maximam partem vel tota nigro-piceo, ventre nigro-piceo-variegato ; raro (♀) superne fere tota testacea. ♂♀. This is the form we usually get in Britain ; it has been taken also in France and Switzerland (J. Sahlberg).

Distribution. It occurs throughout Europe and in Algeria. In Britain it is recorded from twenty-one English counties, viz. all the coast counties from Durham to Somerset, except Lincs, together with Cumberland, Notts, Hereford, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; from the Welsh counties of Carmarthen and Glamorgan, and from both Scotland and Ireland.

308. **Poeciloscytus unifasciatus** Fabr.

Fab., E.S., iv, 178, 153 (1794) ; D. & S., B.H. 467 (1865) ; Saund., H.H.B.I. 256 (1892).

Ova. Length rather less than 1 mm. Shining yellow, cylindrical, strongly bent anteriorly, rounded posteriorly and obliquely truncate anteriorly with collar slightly projecting.

Larvae. " Nympha adulta : ovata, obscure virescens, ubique dense brevissime nigro-hirta, oculis pallidis ; antennis virescentibus, colore in testaceum vergente ; linea media thoracis dorsum percurrente pallida ; abdomine supra medio pallescente, puncto basali nigerrimo ; rudimentis alarum apice late nigris ; apice tibiarum tarsorumque nec non tibiis et tarsis posticis nigricantibus (Reuter, 2).

To this Schumacher has added the following details :

Last instar, 4–6 mm. Broad oval, plump, the whole body except the extremities, with thickly placed, rather long, black bristles ; colour almost entirely dark green, with the extremities more brownish ; head in side view somewhat shorter than high, much swollen ; vertex marked off between the eyes by a clearly recognisable keel ; clypeus prominent and separated from forehead by a slight impression ; eyes nearly touching pronotum, oval, with their long axis nearly vertical, large, prominent, facetted ; antennae four-jointed, almost as long as the body, first joint thickest, clavate, reaching beyond the head, though not quite so long as the head ; second joint three times as long as first, rod-like ; third joint $\frac{2}{3}$ as long as second ; fourth about as long as third ; rostrum four-jointed, robust and reaching to the hind coxae, its first joint very robust, cylindrical, and obliquely ended, second joint much thinner and somewhat longer than first ; third joint shortest, somewhat thicker, but only half as long as second, and pointed at the end, its end pitch-brown ; pronotum trapezoidal, twice as broad as long, anterior and posterior margins nearly straight, side margins slightly curved outwardly ; a fine yellow line down the middle of the pronotum and continued to the scutellum ; scutellum almost semicircular, with a deep depression on each side at the base ; wing-pads distinct and reaching to middle of fourth abdominal segment, a fine line foreshadowing the separation between corium and clavus, and large parts of the inner margins and ends brown ; legs robust, femora, especially the last pair, very strong, with a row of specially long bristles ; end of tibiae brown, tarsi two-jointed, basal joint small and short, apical long and with two claws at the end, its apex brown ; abdomen pointed at the end, with an oval deep black spot between the third and fourth segments.

Life-cycle. According to Schumacher, who has paid great attention to this genus, the first imagines appear at the beginning of June, and by the middle of the month large numbers are to be met with. Several "generations" (by which term he appears to mean merely the results of the hatching of different batches of autumnal eggs), appear successively during the warmer months. By the end of August their numbers have decreased, but larvae may still be found even late in August. The last imagines disappear towards the end of September. Probably the eggs are laid before this, as the species apparently does not hibernate, and hence the insect will exist in the egg form through the winter. The first larvae appear in May, and begin to feed on *Galium*.

Habitat, etc. The species is found amongst herbaceous vegetation in a great variety of places such as roadsides, margins of woods and fields, grassy and sunny hillsides, meadows and marshes, and also upon flowers in chalk-pits. It seems to feed upon several species of *Galium*, such as *G. verum, ochroleucum, mollugo, boreale* and *palustre*. It has, however, been found on many other plants belonging to different natural orders, and Schumacher gives the following list : *Umbelliferae, Achillea millefolium, Tanacetum vulgare, Galeopsis versicolor, Xanthium strumarium, Spiraea ulmaria, Aconitum septentrionale, Atriplex roseus*. Parfitt speaks of finding it on alders. Dalla Torre gives *Rosa arvensis*. It is preyed upon by fossorial Hymenoptera.

Its varieties are thus described by Reuter :

> (*a*) Clavo nigro ; corio stramineo, solum interne vitta apicali, in angulum interiorem cunei excurrente nigra ; cuneo fulvo, macula laterali nigra.
>
> (*b*) Corio nigro, vitta humerali apice solum dimidium exteriorem latitudinis occupante, macula parva anguli interioris apicalis et interdum (♀) etiam margine toto laterali stramineis ; cuneo obscure fulvo saepe ad maximam partem nigro, arcu basali apiceque fulvo vel ferrugineo et stramineo.

It is curious that the golden pubescence does not appear till the adult form is reached.

Distribution. *P. unifasciatus* inhabits the whole of the Palaearctic and Nearctic areas even up to Lat. 69° N. In Britain it is not a very common species ; it has been recorded from seventeen English counties, viz. Northumberland, Cumberland, Yorks, Lancs, Norfolk, Suffolk, Warwick, Oxon, Middlesex, Kent, Surrey, Sussex, Berks, Wilts, Dorset, Devon, and Cornwall. There are no Welsh records, but it is found in both Scotland and Ireland.

309. **Poeciloscytus palustris** Reut.

Reut. Fest. Palm., ii, 18 (1905) ; E.M.M., xlvi, 141.

While searching for the Homopteron *Strongylocephalus agrestis* at the roots of rushes in marshy spots on the Pendine Burrows, Carmarthenshire, I sometimes came across examples of a dark *Poeciloscytus* allied to *P. unifasciatus*, but not agreeing with anything previously notified as British. Dr. Horváth kindly examined a pair of these and returned them to me as *P. palustris* Reut. In his interesting "Hemipterologische Spekulationen, II" (Helsingfors, 1905), Reuter, while treating of the progressive development of melanism observable in the species and varieties of the genus *Poeciloscytus* (amongst others), gives the name *palustris* to the darkest of the European forms of that genus. The description and figure appended exactly agree with the coloration of my insect. This form has by some Hemipterists been regarded as a variety of *P. unifasciatus*, but Reuter himself seems to have left the question open, as it had no bearing on the subject then under consideration. His words are : "The question may in other respects remain open, whether *P. unifasciatus* and its so-called varieties are to be considered only as such, or as separate species. . . . Anyhow, this question is of no essential importance for our present considerations, for which it is pretty much the same thing whether we have here to reckon with varieties or with separate species."

For the same reason, I presume, he makes no reference to structural differences in most of the forms referred to. Horváth's view, like that of the late Mr. E. Saunders, is that the structural distinctions in the present insect, and the difference in habitat, are sufficient grounds for its specific separation, and in this view I certainly concur.

It is not necessary to do more than point out wherein *P. palustris* differs from the allied species. The ♂ is smaller than in *P. unifasciatus*, and the fore parts are duller, because more rugose. The pronotum has no yellow margin, but is wholly black; the scutellum has only the extreme apex yellow; the clavus is black and the corium has only a humeral streak, its apex next the cuneus, and a minute streak at the inner angle just beyond the claval suture, yellow; the cuneus is black, passing into red and then yellow at each end. The antennae are darker and have the terminal joint longer than the third, considerably longer than in *P. unifasciatus*. The femora are chiefly black. The ♀ resembles the ♂ in coloration, rugosity, and structure of antennae, but is slightly broader than in *P. unifasciatus*, and with more rounded sides. Length 4½–5 mm.

Thus the difference in size, the greater rugosity, the length of the terminal joint of the antennae, the general melanic coloration, and the habitat, easily distinguish the insect.

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from July to September.

Habitat, etc. I found one ♂ and one ♀ amongst rushes in a wet field just outside the town of Carmarthen, and one ♀ at roots of rushes at Rookley Wilderness (Isle of Wight). At Pendine, I obtained seven ♀♀ and one ♂, all of them by searching at roots, and I could get none by sweeping, as they were too low down amongst the rushes. In fact, the only specimen I have taken at all by sweeping is the above mentioned ♂ from the wet field at Carmarthen. On the Continent it is found on *Galium palustre*, while *P. unifasciatus* occurs chiefly on *G. verum*, and only very seldom on *G. palustre*. I did not notice any *Galium* in any of the above localities, though other plants were, in some cases, growing with the rushes. But the insects when found were certainly crawling on the rushes.

The ♂ is more active than the ♀ and appears to live higher up the plants.

Distribution. This species occurs in S. Finland (Reuter), Germany (Schumacher), Hungary, and Japan (Horváth). In Britain it has been found only in the places mentioned above, viz. Rookley Wilderness (I.W.), and Carmarthen and Pendine in Carmarthenshire, S. Wales.

310. **Poeciloscytus vulneratus** Pz.

Pz. Faun. Germ., 100 (1806); E.M.M., xxxiv, 15.

This species was discovered in September, 1898, by Mr. H. J. Thouless, on *Galium* on the sandhills at Yarmouth, Norfolk. Mr. Thouless says: "It is a very pretty and conspicuous species, somewhat like *P. unifasciatus*, but considerably smaller than that insect, and at once distinguishable by its paler colour, being scarcely marked with black, and by the shorter and stouter third and fourth joints of the antennae, which taken together do not equal the length of the second. In *unifasciatus* the head and thorax are nearly entirely black, the scutellum black, except at the apex, and the elytra have the clavus and a wide band on the corium black."

Ova and **Larvae.** Unknown.

Life-cycle. The imago appears in June, and the species continues in evidence till the end of September or the beginning of October.

Habitat, etc. All the above were on patches of *Galium verum* growing amongst the short grass. In addition to this food-plant, Reuter gives *Achillea millefolium, Galium mollugo, Anthemis, Echium, Plantago arenaria, Artemisia vulgaris, Salix repens.* Of these the most usual are *Galium, Artemisia,* and *Achillea* (Schumacher). The insects are found both on the plants and at their roots. In sunny weather their movements are very active, and they readily jump from the food-plants on to the ground when disturbed.

Four varieties are thus described by Reuter :

> (*a*) Superne straminea, vertice postice, fronte macula ovata media, clypeo, pronoto lateribus vittisque duabus pone callos, dimidio basali scutelli, clavo medio magis minusve late, corio plagis duabus apicalibus nigris vel ad partem nigro-fuscis. ♂.
>
> (*b*) *typica* : Ut praecedens, sed fronte vittis duabus angustis basi conjunctis nigris, pronoto lateribus solum postico vel solum angulis basalibus nigris, vittis disci medium vix superantibus. ♂ ♀.
>
> (*c*) Capite pallido unicolore, pronoto solum angulis basalibus maculisque duabus parvis pone callos nigris ; hemielytris pallidis unicoloribus vel plagis obsoletis duabus apicalibus nigricantibus. ♂ ♀.
>
> (*d*) Capite, pronoto, clavo et corio totis pallidis immaculatis.

Distribution. It occurs throughout Europe, and passes into Asia Minor, Turkestan, and Siberia. In Britain it has been found only on the sandhills of Great Yarmouth, where it seems to be well established.

311. **Polymerus nigritus** Fall. (Poeciloscytus id. Brit. Cat.).

Fall. Hem. Suec., i, 97, 39 (1829) ; D. & S., B.H. 444 (1865) ; Saund. H.H.B.I. 257 (1892).

Ova. Unknown.

Larvae. Last instar, 3 mm. Pitchy black, with abdomen reddish, and with scattered black pubescence ; a faint reddish line along centre of pronotum and scutellum, and proceeding from a similar widely open V-shaped line on vertex ; head triangular, convex ; pronotum trapezoidal with angles rounded and several transverse impressions ; wing-pads outwardly much rounded, so as to give a broad oval shape to the body ; tibiae and antennae hairy ; hind femora rather incrassated ; two apical antennal joints subequal.

Previous instar, 2¼ mm. Similar, but with very short wing-pads; legs and antennae stouter, last joint of latter reddish.

An earlier instar, 1¾ mm. Similar, but with last antennal joint longer than third.

A still earlier instar, 1¼ mm. Similar, but with no central reddish line, and with last antennal joint much longer than third; antennae longer than body.

Life-cycle. The imago has been found from June to September; the above larvae were taken at the end of May and the beginning of June; the last-mentioned is probably the first instar, and had been hatched only a few days. I have not seen more than these four instars.

Habitat, etc. This species is found on *Galium verum* and *G. boreale*, and on *Stachys sylvatica*, chiefly in chalky and sandy places. I have taken it also in some numbers on a luxuriant growth of *Galium aparine* in a rather marshy place, and by roadside sweeping on the same plant.

Distribution. It is found throughout the greater part of Northern and Central Europe and passes into Siberia and Turkestan, but apparently it does not occur south of the Alps. In Britain its distribution is somewhat limited; it is recorded from nineteen English counties, viz. Cumberland, Durham, Cheshire, Norfolk, Suffolk, Cambs, Oxon, Bucks, Herts, Middlesex, Essex, Kent, Surrey, Berks, Wilts, Somerset, Glo'ster, Devon, and Cornwall. There are no records from Wales, but it has been found in Scotland, though not in Ireland.

312. **Charagochilus gyllenhalii** Fall. (Poeciloscytus id. Brit. Cat.).

Fall. Mon. Cim., 88, 61 (1807); D. & S., B.H. 446 (1865); Saund., H.H.B.I. 256 (1892).

Ova. Unknown.

Larvae. It is curious that nothing seems to be definitely known of the larva of this common insect; I have some which may possibly represent it, but this is only conjecture; these larvae are of a bright orange colour throughout, with triangular head and trapezoidal pronotum, the angles of which are rounded; eyes reddish-brown; over the whole body a scattered pubescence of long whitish hairs; hind margins of abdominal segments whitish; wing-pads slightly translucent, yellowish, pointed at apex, covering three abdominal segments; of antennal joints, second is longest, fourth shorter than third; second and third with short black setae springing from small black spots; tibiae similar; tarsi and claws pale.

Life-cycle. The imago is found with us throughout the summer, from April to October, but according to Reuter, it occurs on the Continent all the year round, and even with us the early specimens are probably over-wintered ones.

Habitat, etc. It lives in dry grassy places and is commonly found on nettles, *Galium verum*, and *G. boreale*. Morley records it from *Scabiosa*.

Reuter adds also *Artemisia campestris* and *A. scoparia.* According to Reuter it is found in Bohemia on dying branches of fir trees, always in great numbers, which consist entirely of imagines ; but as this occurs in July, they are not there with a view to hibernation.

Morley compares the appearance of this insect in the net to that of a *Bruchus* amongst Coleoptera.

There is a form which differs from the type in having the membrane much larger than usual, and placed on a level with the dorsal surface instead of being bent downwards in the customary way ; the legs are also longer and thinner, and this is the case with the antennae also, especially in their last two joints ; the whole insect also is considerably larger than the ordinary form. Douglas speaks of this as the macropterous form, although there does not seem to be anything of a brachypterous nature about the ordinary one. But for the identity of sculpture and coloration in the two, they might almost be regarded as separate species. This form is much less common than the ordinary one; I have met with two specimens only; Norman records it from Perthshire. Outside the limits of the British Isles it has been recorded only from Siberia and the Ladoga district.

Distribution. It occurs throughout the whole of the Palaearctic Province up to 63° N. lat. In Switzerland it rises to a height of 3500 feet. In Britain it is recorded from nineteen English counties, viz. Cumberland, Yorks, Cheshire, Notts, Norfolk, Suffolk, Cambs, Oxon, Worcester, Bucks, Kent, Surrey, Sussex, Hants, Wilts, Dorset, Devon, Somerset, and Glo'ster ; there are no records from Wales, but it is found in Scotland, though not recorded from Ireland.

313. **Liocoris tripustulatus** Fabr.

Fab., E.S., iv, 176, 145 (1797) ; D. & S., B.H. 450 (1865) ; Saund., H.H.B.I. 259 (1892)

Ova. Unknown.

Larvae. " Nympha : Virescens, ubique densius subtiliter nigro-pilosa, oculis, stria interna apiceque articuli antennarum primi, articulis 2 et 3 utroque annulis duobus articuloque quarto, basi excepta, nigris ; femoribus maculis prope apicem annula duo formantibus, tibiis annulo basali apicalique, tarsis annulo ante medium apiceque nigris ; metanoto maculis duabus marginis postici, rudimentis alarum macula apicali maculaque basali dorsi abdominis nigris ; rudimentis alarum basi et medio signaturis viridibus notatis " (Reuter).

This larva can easily be recognised by the above markings, which, though they vary in intensity in different individuals, preserve the same general pattern, save that I have found the tarsi black only at the apex. It is curious that the black setae with which the whole insect is furnished, entirely disappear in the adult, which has the hemielytra furnished with only a very short pale pubescence springing from the punctures, and the rest of its surface glabrous.

Life-cycle. The imago can be found during the greater part of the year; I have records for all months except January, March, November, and December. The insect hibernates as imago, and the over-wintered specimens are of a different colour from most of those which mature in August, viz. a rich orange-brown ground colour with scutellum and cuneus orange; most of the newly produced specimens are more or less of a greenish ochreous ground colour, with black markings and yellow scutellum and cuneus. There seems to be in this insect also as well as in the genus *Miris*, therefore, a certain change of colour during the winter retirement which causes the spring specimens to appear quite distinct from the same insects as they retired into winter quarters. The insects of the year mature in August, and the over-wintered specimens appear in the open in May and June.

Habitat, etc. This species inhabits nettles chiefly, at any rate at the seasons of the year when these plants are flourishing. Parfitt speaks of finding it on the flowers of *Umbelliferae* and on alders. Carr gives *Salix*. According to Reuter, it has been found also on *Spinacia oleracea*, *Scrophularia nodosa*, *S. canina*, *Lamium*, and *Calamintha nepeta*. Dalla Torre gives *Compositae*, *Dipsaceae*, and *Umbelliferae*.

This is a most variable insect, and Reuter mentions nine varieties.

> (*a*) Capite, vittulis frontis, clypei et lorarum nigris exceptis, pronoto antice inaequaliter, linea media margineque postico utrinque, scutello, fascia cunei maculisque pectoris aurantiacis; corio clavoque totis nigris.
>
> (*b*) Ut var. (*a*), sed clavo plerumque macula anteapicali corioque basi et fascia media magis minusve distincta aurantiacis.
>
> (*c*) Pronoto aurantiaco, antice utrinque macula ad callum, maculis duabus magnis posticis angulisque basalibus, margine excepto, nigris; cetero ut var. (*b*).
>
> (*d*) Ut var. (*c*), sed pronoto maculis anterioribus nullis.
>
> (*e*) *pictus* Hahn. Ut varr. (*b*) et (*c*), sed locis pallidis albidoflavis nec aurantiacis; scutello saepe basi nigro-signato.
>
> (*f*) *pallens* Noualh. Tota testacea vel virescenti-testacea, pronoto postice leviter ochraceo, apice cunei nigro.

The other three vars. occur on *Calamintha nepeta*, and are found only in the south of Europe, so need hardly be described here. The very dark vars. (*a*) and (*b*) are found in the autumn; while the spring specimens are chiefly, if not entirely, of the orange vars. indicated in (*c*) and (*d*). Now a change of colour which takes place during a winter retirement is, I believe, of the nature of a deepening of tint; and it is not difficult to imagine the possibility that the pale autumn specimens become the orange spring ones, but it is not at all likely that the black ones become paler. From this it would follow that the black vars. must all perish during the autumn, and in that case the question would arise whether they produce eggs in the autumn to hatch the next season, or altogether fail to leave any offspring. This, however, is all pure speculation, and nothing definite is yet known as to these points ; it indicates, however, the direction in which investigation might proceed.

Distribution. This insect occurs over the greater part of Europe, and extends into Syria, Turkestan, and the country round the river Amur. In Britain it is an abundant and generally distributed species ; there are records from thirty-one English counties, viz. all except Westmorland, Staffs, Derby, Salop, Rutland, Hunts, Worcester, Northants, and Monmouth ; also from five Welsh counties, viz. Carnarvon, Radnor, Brecknock, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland.

314. **Camptobrochis lutescens** Schill.

Schill. Vert. Schl. Gesell., 83 (1836) ; D. & S., B.H. 448 (1865) (punctulatus) ; Saund,. H.H.B.I. 258 (1892).

Ova. Unknown.

Larvae. The larva is very pale ochreous, mottled with greyish-brown, and very hirsute all over with stout, blackish hairs.

Last instar, 2½ mm. Short and broad ; head triangular with reddish eyes touching anterior margin of pronotum ; pronotum transverse, trapezoidal with rounded angles and anterior and posterior margin slightly emarginate ; wing-pads considerably broader than body ; legs and antennae pale ochreous, femora with one broad grey-brown ring, intermediate and posterior tibiae with two such rings and with long black hairs ; second tarsal joint much longer than basal, and slightly infuscated at apex ; second antennal joint with long hairs. It is certainly strange that the larva should be so hirsute, when the adult is glabrous. If the size of this larva should seem small for an insect which, when adult, measures 4 mm., it must be remembered that a good deal of this measurement is occupied by the membrane, which far overlaps the body.

Life-cycle. The imago may be found practically all the year round. I have records for every month except January and November. The insects of the year appear to mature about midsummer, but, as larvae are not to be met with except in the spring, the insect is, apparently, not double-brooded, and the spring specimens are over-wintered examples, which seem to last on till the new brood appears. Both sexes hibernate, and therefore impregnation probably takes place in the spring, and is most probably followed soon by oviposition. It is often found gregariously under bark in winter.

Habitat, etc. Unlike the last, this is chiefly an arboreal species, and I have found it principally upon oaks; it occurs also on other trees, such as lime and maple. Reuter gives in addition *Alnus, Salix, Corylus, Crataegus, Fagus, Prunus domestica, P. padus, Ulmus*, and *Populus*. Morley (4) has taken it also on box. It has been recorded also from a few low plants, such as *Tanacetum, Achillea, Calluna*, and *Pteris*; these occurrences are probably more or less accidental. An allied species, however, *C. punctulatus* Fall., regularly occurs on low plants, viz. *Tanacetum, Achillea, Artemisia, Senecio, Urtica*. This species, though extending on the Continent further north, has not yet been found with us. It may be distinguished by its punctured scutellum, that part in *C. lutescens* being smooth.

An allied species has been accused of sucking the eggs of a Galerucid beetle (Howard).

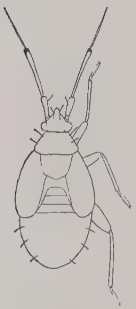
Distribution. Its area consists of Central and Southern Europe, as well as Algeria, Transcaucasia, and Northern Persia. In England it is not nearly so common as the preceding insect and does not extend farther north than Norfolk. It is recorded from fourteen English counties, viz. Norfolk, Suffolk, Cambs, Oxon, Bucks, Herts, Middlesex, Essex, Kent, Surrey, Berks, Wilts, Somerset, and Glo'ster; it does not seem, therefore, to be very partial to the sea. The only Welsh record is from Glamorgan, and it is recorded from Scotland, but not from Ireland.

315. **Capsus ruber** Lin. (Deraeocoris id. Osh. Cat.; D. segusinus Müll. Reut.).

Lin., S.N. 446, 44 (1758); D. & S., B.H. 442 (1865) (capillaris); Saund., H.H.B.I. 260 (1892) (laniarius).

Ova. Length about $1\frac{3}{4}$ mm. Cylindrical, curved, especially at anterior end, rounded posteriorly, truncate anteriorly. Colour reddish-yellow.

Larvae. Last instar, $5\frac{1}{4}$ mm. Form obovate and rather flattened. Colour reddish or purplish-brown. Head large, with a central furrow, communicating with shallow depressions on the sides and vertex; clypeus furnished above with a few stout black clavate setae, and beneath with fine whitish hairs; other very stout black setae placed symmetrically on different parts of the head; eyes rather prominent; (black setae similar to above are distributed over the whole body in the earlier instars, but are much less numerous in the later ones); pronotum trapezoidal with rounded angles, especially the posterior ones; wing-pads large, extending to third abdominal segment; antennae having basal joint concolorous with body, and equally set with black setae; second joint slightly clavate, yellow with reddish-brown base and apex, and furnished with a number of long black hairs; third joint yellow, more or less infuscated and furnished with finer hairs; fourth joint fusiform, red, and almost glabrous; femora concolorous with body


Nymph of *Capsus ruber* L.

except at apex, where they are rather widely yellow, tibiae yellow with a reddish-brown streak on the upper half, which is much more distinct on the posterior legs and becomes also more distinct in all as the insect grows older, tarsi two-jointed and fuscous; legs more or less hairy, especially the hind pair; rostrum yellowish, becoming brownish towards the tip, not passing beyond intermediate coxae, basal joint very stout; no puncturation is traceable; terminal segment of abdomen tubular.

2nd instar, 2¼ mm. Similar to above, but with abdominal setae more prominent, and at lateral margins collected into brushes; tubular termination of abdomen longer in proportion; rostrum reaching posterior coxae.

3rd instar, 2¾ mm. Similar to second; the three thoracic segments decreasing in length from before backwards.

4th instar, 4 mm. Similar to above, but with wing-pads in a rudimentary condition, causing the meso- and metanotum to be considerably wider than pronotum.

From the above it will be seen that in the coloration and shape of the legs and antennae, and in the distribution of hairs upon them, the larvae closely resemble the imago; in the adult, however, the hairs are more closely packed, especially upon the antennae; but the stout black setae, which are so prominent a feature in the early stages, entirely disappear when the insect reaches maturity, being discarded in the last moult. Can it be that these setae are protective while the insect is soft-bodied and unable to fly, and therefore disappear when its integument becomes harder and when, by having acquired the power of flight, it has in this a ready means of escaping from any enemies less active or not similarly endowed? Strong setae such as these are, I think, generally indicative of predatory habits.

Life-cycle. The imago is found from June to September, but the majority of specimens appear to mature during July. There are no records of its occurrence in either winter or spring, and it may be safely concluded that the insects perish in the autumn, having laid eggs which will develop in the following spring and early summer.

Habitat, etc. It occurs by sweeping amongst nettles and other luxuriant low herbage; but it has been occasionally found upon trees. Reuter gives the following list of plants as affording it shelter: *Urtica, Carduus crispus, Lamium, Ballota, Senecio, Verbascum, Asphodelus ramosa, Rosa, Prunus, Populus, Salix, Carpinus, Corylus avellana, Larix, Pinus sylvestris.* Douglas and Scott add bramble flowers. It is also often found in gardens upon fruit bushes. Certainly this is a curious mixture, which lends further countenance to the idea of predatory habits. Douglas speaks of a brood as having taken possession of a clump of raspberry plants in his garden; they were born and bred there and mostly remained, and he adds, " Like all other *Capsidae*, it is credited with being a feeder on the juices of leaves, and I was therefore somewhat surprised yesterday to see one individual that was not a vegetarian. On the flower-umbels of a *Heracleum*, the stems of which were literally covered with larvae of a pale green Aphid, the *Capsus* stood motionless, rostrum exserted and arched, the tip in the body of one of the Aphids, and so gently inserted (after the manner in which Izaak Walton advises a hook to be passed into a worm), that there was no resistance by the victim. If this was the beginning of a feast, there was an abundant supply of the delicacy to continue the revel, which, in the nature of things, could not last long." The next day the same observer records : " To-day I witnessed the assault of a *Capsus laniarius* [*ruber*] on one of the aforesaid Aphids which, however, did not take it quietly, but at first resisted vehemently but ineffectually the rapidly exhausting effect of the insertion of the rostral lancet into its body. There were three others of the *Capsus* on the leaves of the plant, resting, presumably after an aphidian banquet." This observation as to the relation between *C. ruber* and Aphides has been confirmed by Verhoeff, the *Aphis* in this case being *A. rosae.* I have also myself reared one specimen through its last larval instar by feeding it with the black Aphides which infest the broad bean. Hamm found in his garden at Oxford a specimen of this bug which was attacking the butterfly *Pieris rapae* L. after it had been caught and killed by a web-building spider (" Proc. Ent. Soc.," 1915, cxxx). According to Morley, this species can inflict a painful puncture with its rostrum.

Pierret asks the question, " Is it possible that a bug can develop an ether which, under certain conditions, will cause anaesthesia to itself ? " and answers it in the following way : " Last week I collected on some nettles, four examples of *Capsus capillaris* [*ruber*] and two *Heterotoma*, all of which I put into a small tube 50 mm. long and 8 mm. diameter ; some time after, not one of them moved, although they did not appear to be dead. The odour exhaled appeared to me to be the same as that of the compound ethers known and employed in commerce under the name of fruit-essences ; and corroborating this impression by observing the complete insensibility of the insects, I considered whether they themselves, after having discharged their (supposed) etherial emanations within a restricted and enclosed space, had not succumbed to their anæsthetic action ; actually, when they had been for some minutes under the influence of a fresh atmosphere which was charged with a little ammonia, the *Capsidae* came back to life. The experiment was then tried under a small bell-glass in which I had put a drop of acetic ether to be volatilized, and I obtained a result identical with the former, namely the same insensibility, the same appearance of anaesthesia, and the same time for recovery. It seems to me, after these facts, that it may be possible to establish that the emanation from certain

Hemiptera is a true ether, having the power of affecting even the producers themselves."

Reuter describes six varieties of this insect :

(*a*) *capillaris* Fabr. Capite, pronoto, scutello, pectore hemielytrisque flavo-ferrugineis, cuneo apice abdomineque nigris, hoc saepe ferrugineo-marginato ; pedibus flavo-ferrugineis, femoribus versus basin nigris.

(*b*) *danicus* Fabr. Niger, capite, pronoto antice et lateribus, scutello, corio ultra medium, cuneo, pectore, medio excepto, femoribus apice late tibiisque flavo-ferrugineis vel rubris ; apice cunei saepe sanguinei nigro.

(*c*) Ut praecedens, sed pronoto toto nigro.

(*d*) Niger, capite, apice excepto, apice scutelli, corio basi sat anguste, femoribus apice late tibiisque flavo-ferrugineis, cuneo sanguineo, apice nigro.

(*e*) *tricolor* Fabr. Niger, capite, femoribus apice late tibiisque flavo-ferrugineis, clypeo, vitta frontis media tibiisque saepe basin versus piceo-nigris ; capite raro toto nigro-piceo ; cuneo sanguineo apice nigro.

(*f*) *concolor* Reut. Ut var. (*d*), sed etiam cuneo toto nigro.

Distribution. It is distributed over the whole of Europe, rising in the Alps to the height of 3000 feet. It occurs also in Algeria and in both North and South America. In Britain, it is recorded from twenty-three English counties, including the coast counties from Norfolk to Glo'ster, except Dorset, together with Notts, Leicester, Cambs, Beds, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; the Welsh records are from Carmarthen and Glamorgan. There are no records from either Scotland or Ireland. Thus the northernmost record is from Notts, and the insect seems to belong especially to Midland, including those parts of the east coast in the same latitude, and Southern England, though its absence from the Dorsetshire list is surprising, considering the thorough work done by the authors of the " Natural History of Glanvilles Wootton."

316. **Capsus scutellaris** Fabr. (Deraeocoris id. Reut. Osh. Cat.).

Fab., E.S., iv, 180, 163 (1794) ; D. & S., B.H. 443 (1865) ; Saund., H.H.B.I. 261 (1892).

Ova. Unknown.

Larvae. Undescribed.

Life-cycle. The imago occurs in June and July.

Habitat, etc. This species is found amongst heath (*Calluna*). On the Continent it is recorded also from *Sarothamnus*, from grass in dry places, and from *Betula* in Denmark, and Douglas and Scott mention bramble flowers. But it is evidently much more constant in its attachment than the preceding species.

There are three varieties which are very easily distinguished :

(*a*) *scutellaris* Fabr., with red scutellum.
(*b*) *alboscutellatus* Reut., with white scutellum.
(*c*) *morio* Boh., with scutellum black, like the rest of the insect.

The second of these is recorded from Siberia only. The other two vars. occur in each sex and both are found with us.

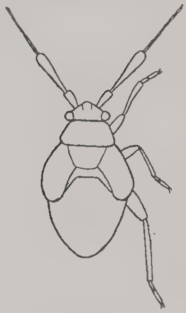
Distribution. It is found over the greater part of Europe except the extreme north (but up to 65°), and extends also into Asia Minor, Turkestan, Siberia, and Northern Mongolia. In Britain it is a rare species and is almost confined to the south of England ; it is recorded from eight counties only. viz. Cumberland, Norfolk, Essex, Kent, Surrey, Dorset, Devon, and Cornwall, There are no records from either Wales, Scotland, or Ireland.

317. **Rhopalotomus ater** L. (Capsus id. Reut. Osh. Cat.).

Lin., S.N. 725, 72 (1767) ; D. & S., B.H. 440 (1865) ; Saund., H.H.B.I. 262 (1892).

Ova. Length about $1\frac{3}{4}$ mm. Cylindrical, strongly, and uniformly curved, rounded posteriorly, truncate anteriorly and with a well developed collar ; colour, very pale yellowish. Leuckart's description is practically the same as for *Lygus viridis* (q.v.).

Larvae. " Nympha crassa, robusta laevis, opaca, squamulis pedunculatis, erectis, brevibus, albidis parce pilosa ; capite imagini simili ; vertice ad oculos utrimque foveolato ; antennis ut imaginis, sed brevioribus, rostro coxas posticas superante ; pronoto capite lato paullo latiore, longitudine duplo latiore, basi apiceque truncato, haud declivi ; mesonoto pronoto aequilongo, apice obtusangulato ; rudimentis alarum apicem segmenti dorsi secundi vix superantibus ; pedibus valde robustis, tibiis spinulosis, tarsis articulo secundo primo fere triplo longiore. Caryophyllea, subfarinoso-opaca, femoribus apice annulis binis obscurioribus " (Reuter, 2).



Nymph of *Rhopalotomus ater* L.

3rd instar, 2 mm. long ; fourth, 3 mm., ; fifth, 4 mm.

This larva can scarcely be mistaken ; its peculiar pale purplish colour and dull appearance, combined with its robust form and the clavate second antennal joint, are sufficient for its recognition.

Life-cycle. The imago may be found in the open from May to September, but some few specimens hibernate during the winter months, occurring amongst dead leaves. The larvae mature in May and early June, and it is in the latter month that the perfect insects are most numerous.

Habitat, etc. It occurs amongst long grasses in all sorts of situations, as well as amongst nettles I have found it also on sandhills at the roots of *Psamma arenaria*, and on a saltmarsh amongst succulent saline plants. Morley records it also from the flowers of *Heracleum sphondylium* and *Spiraea ulmaria.*

The thin terminal joints of the antennae often suffer damage.

Reuter describes four varieties :

(*a*) *ater* Linn. Nigra antennis etiam basi, capite pronotoque nigris ; pedibus nigris, tibiis posterioribus medio tarsisque basi sordide testaceis.

(*b*) *tyrannus* Fabr. Nigra, antennis articulo primo inferne, pedibusque rufis, femoribus annulis duobus anteapicalibus magis minusve distinctis apicibusque tibiarum et tarsorum nigris.

(*c*) Nigra, capite pedibusque rufis. ♂.

(*d*) *semiflavus* Linn. Nigra, capite pronotoque rufis, pedibus ut in var. (*b*).

I have a ♂ specimen, taken by Mr. W. E. Sharp at Amberley, Sussex, July 3rd, 1908, which agrees with the description of *R. intermedius* Reut., except for the absence of dark rings at the apex of the femora. It is rather larger than *R. ater*, measuring 7 mm., with a more shining pronotum, a second antennal joint which is not clavate, but gradually increasing in thickness to the apex, and red legs, the tibiae being black at base and apex. It differs also in having the ventral surface of apex of abdomen strongly rugose, instead of smooth as in *R. ater* ; this is a character, however, which is not referred to in the description of *R. intermedius.* Moreover, *R. intermedius* is at present recorded only from Western Siberia. I therefore hesitate to bring this forward as a distinct species at present, in the hope that further specimens may be discovered.

Distribution. *R. ater* is distributed throughout Europe up to 65° N. lat., and extends also into Algeria and N. America. In Switzerland it rises to a height of 4000 feet. In Britain it is very widely diffused, and is recorded from thirty-one English counties, i.e. from all except Westmorland, Staffs, Derby, Salop, Rutland, Hunts, Beds, Hereford, and Monmouth ; the Welsh records are from Brecknock, Carmarthen, and Glamorgan ; and it is found in both Scotland and Ireland.

318. **Pithanus maerkeli** H.S.

H.S. Wanz., iv, 78, fig. 406 (1838) ; D. & S., B.H. 281 (1865) ; Saund., H.H.B.I. 219 (1892).

Ova. Length $1\frac{1}{2}$ mm. Of the usual tubular shape, rounded at the posterior end, thence almost straight till near the anterior end, where it is abruptly bent ; the anterior end itself is very obliquely truncate, with a collar of moderate dimensions ; colour brownish-yellow.

Larvae. “ Nympha elongata, capite pronoto latiore, hoc fere rectangulari, brevi, lateribus modice rotundatis et mox pone apicem incisis, mesonoto pronoto fere aequilongo, cum rudimentis alarum hoc paullo latiore, rudimentis alarum brevibus, apicem metasterni parum superantibus ; abdomine corpore reliquo magis quam dimidio longiore. Capite, dorso thoracis rudimentisque alarum fusco-ferrugineis ; thoracis dorso linea media longitudinali angusta pallida ; abdomine sordide virescenti, dorso seriebus tribus longitudinalibus punctorum fuscorum notato ; antennis pedibusque ferrugineis, femoribus basi pallidis " (Reuter, 2).

To this it may be added that the outer half of the wing-pads is flavous, and that in the earlier instars the head is not much broader than the pronotum, and that in all stages the joints of the tarsi do not show the inequality that exists in other *Capsidae* ; in the last instar they are subequal in the posterior pair, the basal joint a little shorter in the intermediate pair, and about half as long as the second in the front pair. In an earlier instar, 3 mm., the basal joint is throughout shorter than the apical, but never so much so as in the rest of the *Capsidae*. Morley says of the still younger instars that they have beautiful bright yellow markings, which make them very conspicuous.

Life-cycle. The imago occurs from June to September. The larvae become full-grown by about the middle of June, or a little later.

Habitat, etc. It is found by sweeping amongst tall vegetation, especially grasses in dry places. But it is not confined to such spots ; Morley records it as abundant in the wettest parts of salt marshes in Suffolk. Parfitt mentions finding it on *Anthemis cotula*. It is almost always brachypterous in both sexes ; the macropterous form, of which only the ♀ is recorded, is very rare. A specimen is recorded by Douglas and Scott as taken by Dr. Power at Shirley, Surrey, in August, 1862 ; I have one taken by E. Saunders at Chobham, Surrey, in July, 1880, and one, without locality, *ex coll.* Capron.

Distribution. It is spread over Europe, but seems to be commoner in the northern parts, and extends to 68° N. lat. It passes also into Algeria and Siberia. In Britain it is a common and generally distributed species, being recorded from twenty-nine English counties, i.e. all except Staffs, Derby, Salop, Worcester, Leicester, Cambs, Rutland, Hunts, Beds, Northants, and Monmouth ; and from the Welsh counties of Carnarvon, Brecknock, Carmarthen, and Glamorgan. It is found also in both Scotland and Ireland ; Reuter met with it in Orkney and Shetland.

319. **Myrmecoris gracilis** Sahlb.

Sahlb. Mon. Geoc., 123 (1848) ; E.M.M., xxxix, 270.

As this species has been added to our fauna since the publication of Saunders' "Hemiptera-Heteroptera of the British Islands," the diagnosis given by the author of that work in " Ent. Mo. Mag.," xxxix, p. 270, is here appended.

"In general form very much like a *Formica*, and about the length of *Pithanus markeli*, but much narrower, dark blackish-brown, legs and antennae paler; second joint of the latter darkened on its apical half; elytra (form. brach.) with base and apex whitish, (form. macr.) with a triangular spot at the base, and a posterior transverse band white; abdomen with sides of connexivum having white triangular spots at joints of segments; head with eyes large, projecting beyond sides of pronotum, which they touch posteriorly; face elongate, triangular; antennae as long as the entire insect, rostrum reaching beyond the intermediate coxae; pronotum slightly convex, its anterior margin rounded, sides converging to the base; mesonotum short, very convex, its sides very rapidly diverging posteriorly; elytra (form. brach.) hardly longer than mesonotum, (form. macr.) longer than abdomen, without any distinct cuneus, and with only a single cell in the membrane; abdomen somewhat spherical, strongly constricted at the base; legs long, especially the hind pair; tibiae with very fine inconspicuous hair-like spines on their outer, and with stronger spines on their inner sides. Long. 4–5 mm." A coloured figure is given in E.M.M., xliv, Pl. iii.

Ova and **Larvae.** Unknown.

Life-cycle. The imago is met with from June to August.

Habitat, etc. This insect is associated with ants' nests, though it is impossible to say in what way. The first British specimen, which I had the pleasure of finding on heathy ground at Fleet, Hants, when searching for *Systellonotus triguttatus*, was running about very rapidly on the bare ground between the patches of *Calluna*, on which same ground the *Systellonotus* occurred. Thus my specimen was not found actually in an ants' nest, though there was a nest of *Acanthomyops niger* L. not far off, and workers from this nest were running about on the same ground. The second specimen was taken by Mr. George Arnold at Brockenhurst, New Forest, in a nest of *Formica rufa* which was built on a sandy bank forming the bottom of the hedge of New Park enclosure. The captor had sifted some 18 inches of the leaves and bents in search for the small ant *Formicoxenus nitidulus* when he saw the *Myrmecoris* crawling on the sandy part of the nest which had been exposed. Reuter describes two varieties of this insect, one, *rufuscula*, found with *Formica rufa*, and the other, *fusca*, found with *F. fusca*. My specimen represents the var. *fusca*. As *Acanthomyops niger* is much smaller than *Myrmecoris*, it could only resemble the young larvae of the bug, but the two larger ants mentioned above have much more resemblance to the Hemipteron, and are therefore more likely to be its true models if this is a case of protective mimicry.

This insect also strongly resembles the young larva of *Alydus calcaratus*, but the ant-like aspect is produced in a different way in the two insects. In the *Alydus* the actual head is large and the thorax narrow behind it, just as is the case with an ant; but in *Myrmecoris*, to get the effect of a large formiciform head, the thorax is much widened in front, so that the produced base of the head behind the eyes, characteristic of most ants, is here represented by the front part of the pronotum, and two parts of the insect go to make up the imitation of the ant's head. Of course this resemblance ceases in the later stages of the *Alydus* larva, when it becomes considerably larger than the *Myrmecoris*.

Distribution. This is a rare insect, and in Oshanin's Catalogue it is recorded only from Northern and Central Europe and Siberia. Its area extends to 65° N. lat. Only the two specimens above mentioned have occurred in Britain, and both of these were found in Hampshire.

Sub-family II. **Bothynotina.**

This sub-family contains only two species, belonging to as many genera; one is Indian and the other Palaearctic. It is, of course, only with the latter that we are concerned here. The curious and quite exceptional feature of the hairy membrane should be specially noticed.

320. **Bothynotus pilosus** Boh.

Boh. Öfr. V.A. Hand., 68 (1852); Saund., H.H.B.I. 263 (1892).

Ova. Unknown.

Larvae. "Nympha breviter ovalis, crassa, haud punctata, opaca, undique dense longissime molliter pilosa; capite verticali, longitudine parum latiore; oculis ab apice pronoti remotis, exsertis, rotundis; fronte oculo triplo latiore; antennis articulo primo apicem clypei sat longe superante, secundo fere aequaliter incrassato, tertio hoc $\frac{1}{4}$ breviore, quarto tertio aequilongo; pronoto basi longitudine $2\frac{1}{3}$ latiore et apice tantum dimidio latiore, breviter convexo, disco antice utrinque striga impressa valde obtusangulata nigra; mesonoto pronoto aequilongo, apice latissime rotundato; abdomine late ovali, crasso, medio pronoti apice triplo latiore; rudimentis alarum ovalibus, tantum maculam basalem dorsi attingentibus; pedibus breviusculis; statura *Chermi abietis* L. valde similis. Obscure sanguinea, opaca, dense et longe fusco-pilosa, capite, oculis vittaque apicali utrinque exceptis, lineis duabus angulatis pronoti impressis, rudimentis alarum, macula rotundata basali dorsi abdominis nec non abdomine apice fusco-nigris; antennis pedibusque fumatis. Long. $2\frac{3}{4}$ mm. (Reuter, 2).

Life-cycle. The imago occurs from July to October, but the rest of the history is a blank.

Habitat, etc. This species inhabits conifers; it has been found on spruce fir and Scotch fir. But it has appeared also where no coniferous trees were growing. Bloomfield took it in a sandpit at Guestling, Sussex, on the outskirts of a wood of considerable extent, and I have swept it in a copse of oak, hazel, etc., not far removed, however, from a plantation of

Scotch firs. Reuter reports it as taken in moss in Norway, and suggests that it may have been in search of winter quarters. It is not definitely known, however, whether this species survives the winter. In Norway also it has been found crawling about on the snow-fields at the end of July.

It is dimorphous in the ♀, the brachypterous form which is the less rare having no membrane to the elytra.

Distribution. It is found throughout Europe, but is everywhere a rare insect. In Britain it is of very occasional occurrence and usually occurs singly, or at most in small numbers. It is recorded from five English counties, viz. Cumberland, where the ♂ has recently been taken by Messrs. J. Murray and Routledge; Norfolk (Edwards); Kent, where I took a specimen in the Blean Woods near Herne Bay; Sussex, where a macropterous ♀ (unique as British and now in the Saunders' Collection at the Hope Museum, Oxford) was taken by Mr. E. P. Collett and two brachypterous ♀♀ by the Rev. E. N. Bloomfield; and Devon, where it has occurred to Mr. T. Edmonds. It has also occurred in Scotland, where Dr. Sharp captured four on the hills between L. Long and L. Lomond, at a height of 1500 feet, and Macgregor took it in a plantation of Scotch fir. In the Tyrol it rises to a height of 6300 feet.

Sub-family III. **Bryocorina.**

This sub-family contains a considerable number of genera, and reaches its greatest development in the Neotropical Region. Only two species, belonging to as many genera, occur with us, and they are both associated with ferns. The Neotropical species are mostly small, but extremely beautiful, and often have the scutellar region much swollen. The British species, on the other hand, are very ordinary looking insects, easily recognised when macropterous by the unicellular membrane. They are gregarious, and occur in great abundance on ferns.

The genera may be thus distinguished:

Fourth joint of antennae distinctly shorter than third . .	*Monalocoris.*
Third and fourth joints of antennae sub-equal . . .	*Bryocoris.*

321. **Monalocoris filicis** Lin.

Lin., S.N., 718, 20 (1767); D. & S., B.H. 279 (1865); Saund., H.H.B.I. 229 (1892).

Ova. Unknown.

Larvae. "Nympha late ovata, toto virescenti-alba" (Reuter).

Last instar, 2 mm. Entirely pale green; pronotum trapezoidal, much narrower in front than behind, where it is slightly emarginate; head with eyes broader than front margin of pronotum; wing-pads long; antennae stouter than in imago; whole surface glabrous.

Life-cycle. The imago may be found from May to October. Most of the larvae mature from the middle to the end of July, and hence it is possible that the earlier specimens may be over-wintered ones, though there is no direct evidence of its occurring in the winter months.

Habitat, etc. This species frequents the bracken (*Pteris aquilina*), but it has been found on other ferns as well; Reuter gives *Polystichum* and *Asplenium*. Buchanan White found it in Scotland always on *Athyrium filix-femina* and *Lastraea dilatata*, J. E. Mason on *Aspidium filix-mas*, and I have found a small variety in Snowdonia on a *Lastraea*, possibly *oreopteris*. I have also taken it on furze, but this was doubtless a merely casual occurrence. It varies somewhat in intensity of coloration, and some specimens are dark brown, almost black. The membrane is usually bent down so as to cover the end of the abdomen, but occasionally specimens are met with in which this is not the case, but the membrane lies in the same plane as the rest of the hemielytra; such specimens, of course, look larger than usual.

Distribution. This insect is spread over a very wide area. It may be found all over Europe and Siberia, reaching 66° 20′ N. lat.; and it also occurs commonly in North America. In Britain it has been recorded from thirty English counties, i.e. from all except Westmorland, Staffs, Salop, Warwick, Rutland, Hunts, Cambs, Beds, Northants, and Monmouth; the Welsh localities are in the counties of Carnarvon, Radnor, Brecknock, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland.

322. **Bryocoris pteridis** Fall.

Fall., Mon. Cim., 105, 20 (1807); D. & S., B.H. 277 (1865); Saund., H.H.B.I. 228 (1892).

Ova. Length ½ mm. Greenish-yellow, short and broad, nearly straight; truncated anteriorly, rounded posteriorly; considerably constricted below the anterior rim, which is considerably broader than the body of the egg.

Larvae. The larvae are of a most delicate whitish-green, and shaped very similarly to those of *Monalocoris*; they differ, however, in the proportion of the antennal joints as in the adult, and in the following points of coloration: a spot at the extreme base of all the tibiae, and the base of the first antennal joint, pitchy black; apex of second and third antennal joints, and whole of fourth, together with apex of tarsi, infuscated. The dark contents of the abdomen show through the integument, making a dark patch in the centre; the terminal joint of the tarsi is considerably incrassated, and the whole surface is glabrous.

Last instar, 2 mm. Wing-pads as in *Monalocoris*.

Penultimate instar, 1½–1¾ mm. Wing-pads quite small.

The above descriptions apply to larvae which would have produced the brachypterous form; I cannot say what modifications occur in those that produce the macropterous.

Life-cycle. The imago occurs from June to September, but larvae may in some places still be found even in August.

Habitat, etc. This species also inhabits ferns; in England it usually occurs on *Athyrium filix-femina*, but Buchanan White, J. E. Mason and Parfitt found it on *Lastraea dilatata* and *Athyrium filix-mas*, Norman on *Lastraea oreopteris*, and Mason also on *Pteris aquilina*. On the Continent it has been found on *Polystichum* and *Asplenium*. Parfitt met with it on ferns growing in a nursery garden.

It is dimorphous in both sexes, but the brachypterous forms are far commoner than the macropterous. The brachypterous cannot fly, and even the macropterous are disinclined to use their wings. The ♂ is far less frequent than the ♀.

The macropterous form is very unlike the brachypterous, but careful examination shows the identity of head, pronotum, and antennae.

Distribution. This insect is far less widely distributed than the preceding; it is found chiefly in Northern and North-central Europe, and in Siberia. In Britain it has been recorded from twenty-one English counties, viz. Northumberland, Cumberland, Westmorland, Yorks, Lancs, Cheshire, Notts, Leicester, Lincs, Norfolk, Hereford, Glo'ster, Oxon, Bucks, Kent, Surrey, Sussex, Hants, Dorset, Devon, and Cornwall, but in several of these counties it is not at all common; the Welsh records are from Denbigh, Carnarvon, Merioneth, Brecknock, Carmarthen, and Glamorgan, and it inhabits both Scotland and Ireland. I have found the macropterous form not uncommon in Wales, especially in Carmarthenshire, but always on *Athyrium filix-femina*.

Sub-family IV. **Macrolophina.**

This section contains upwards of fifty genera, and is represented in all parts of the world. Less than one-third of the genera are Palaearctic, and of these only five are met with in Britain. They are elongate and delicate insects, arranged by Reuter in three divisions, of which two only concern us here.

Divisions of the Macrolophina.

1. (2) Arolia absent; wing-cell with a hamus	1. *CREMNOCEPHALARIA.*
2. (1) Arolia present; wing-cell without a hamus	2. *MACROLOPHARIA.*

Division *a.* *CREMNOCEPHALARIA.*

This division is a small one, finding its fullest representation in the Ethiopic Region. The Palaearctic Region contains under thirty species, and two insects of different genera constitute our contribution to it. Both live on the ground in heathy places. The genera may be thus distinguished:

1. (2) Eyes touching pronotum . . .	1. *Allodapus.*
2. (1) Eyes not touching pronotum . . .	2. *Systellonotus.*

323. **Allodapus rufescens** Burm.

Burm. Hand., ii, 278, 4 (1835); D. & S., B.H. 472 (1865); Saund., H.H.B.I. 266 (1892).

Ova. Unknown.

Larvae. "Nympha colore staturaque imagini simillima" (Reuter, 2).

A specimen taken by Mr. C. Morley, June 13th, 1907, may be described as follows: Ochreous, more or less shaded with reddish-brown. Head with vertex convex; pronotum transverse, sides nearly straight, anterior angles rounded; wing-pads considerably wider than pronotum, ochreous at base, passing into brown at apex; abdomen ochreous at base, the rest reddish-brown; the whole surface with very short scattered black hairs; antennae rather long, four-jointed, fourth joint longer than third, ochreous, second joint brown at apex, third and fourth more or less brown, the whole with short hairs which are black except on fourth joint, on which they are very fine and white; legs stout, ochreous, more or less stained with red; femora and tibiae spotted, tarsi black; claws stout at the base, and all parts of the legs covered with black hairs; hind femora elongated. Length $3\frac{1}{3}$ mm.

Life-cycle. The imago occurs from July to September. The larvae mature about the middle of July.

Habitat, etc. This species is found on heaths, where it runs about in the small open spaces amongst the clumps of *Calluna*. Reuter and Saunders state that it appears most frequently in the evening, and the former speaks of taking it in some numbers by evening sweeping. I have, however, found it equally in the hottest parts of the day, in brilliant sunshine. J. E. Mason (3) describes finding it in the Scilly Is. "where nothing grows but the dwarfed heather prostrate to the ground, and scathed by the fierce west winds." Halbert took a macropterous example in Ireland by sweeping heather at dusk. Donisthorpe records it as taken by Evans with *Formica fusca* at Balquhidder. According to Reuter, Bedel took it in nests of the ant *Atta structor*, and Puton with a species of *Formica*. The same author also states that it is found in moss in wooded meadows.

It is dimorphous in both sexes, and the brachypterous form has the hemielytra destitute of membrane; the macropterous is very rare everywhere. Douglas and Scott mention one taken by Dr. Power on Plumstead Common.

Distribution. *A. rufescens* is found throughout Europe, and also in Siberia and Turkestan. In Britain it has been recorded from eleven English counties only, viz. Yorks, Norfolk, Suffolk, Kent, Surrey, Berks, Hants, Wilts, Devon, Cornwall, i.e. the Scilly Is., and Glo'ster. The only Welsh record I know of is that I found it on a piece of marshy and heathy ground at Sarnau, near Carmarthen (Butler, 32). It is recorded from both Scotland and Ireland. Three other species have been described, and it is possible that a specimen I have, which was taken at Swalecliffe, near Whitstable, may represent one of them.

324. **Systellonotus triguttatus** Lin.

Lin., S.N., 719, 94 (1767); D. & S., B.H. 370 (1865); Saund., H.H.B.I. 265 (1892).

Ova. Unknown.

Larvae. "Nympha imaginis feminae sat similis" (Reuter, 2).

A larva, evidently ♂, taken by Mr. C. Morley, June 6th, 1916, may be thus described: Length 3 mm. Brown; head rounded, constricted behind, with a reddish, deeply arcuate line running from eye to eye; pronotum narrower than head, broader than long, with sides sinuate, widest a little before the hind margin; wing-pads long, brown at base and apex, whitish-yellow between; the pale colour forming a band across the body; abdomen brownish-red, yellow-banded at base, with long white hairs; legs brown, tibiae yellow at apex; tarsi two-jointed and as in *Allodapus*, with the second joint very long; femora with a few black bristly hairs on both outer and inner edge; antennae four-jointed, second and third joints longest, sub-equal.

A younger instar. Length 2½ mm.; similar, but with pronotum more transverse and with straighter sides; very rudimentary wing-pads, which are whitish at apex; abdominal hairs not so long.

Life-cycle. The imago occurs from June to August, though, as above, larvae may still be found in the last of these months.

Habitat, etc. This is a myrmecophilous species, and occurs in heathy places, running about on the ground in the neighbourhood of the nests of the ants. Douglas took it in some numbers with *Formica fusca* at Weybridge, Saunders found it running amongst a colony of *Acanthomyops niger* on a hillock covered with *Hieracium pilosella*, and I have taken it on a heath at Fleet, Hants, running rapidly between the patches of *Calluna* in the near neighbourhood of a nest of the same ant. Breddin suggests that it may feed on dead ants. The above-described larvae were taken by Morley in company with *Acanthomyops alienus* and *Tetramorium caespitum*. According to Reuter it is found also in dry places on hills and plains, and at the roots of grasses, as well as on *Umbelliferae*. He adds that he has found both sexes under stones in company with *Acanthomyops niger* and females also in the mounds of the same ant. I have met with it also on sandhills at Camber, Sussex, and Kidwelly, Carmarthenshire. Flor speaks of it as occurring on dry flat places upon mountain sorrel overgrown with heather.

The ♂ is always macropterous, and is therefore scarcely ant-like, but the ♀ closely resembles the workers of the ant *A. niger*, since it has the merest rudiments of elytra and a more or less globose abdomen; its movements, however, are sufficiently different from those of the ants to enable it to be recognised. It is extremely active in both sexes. Amongst British species its ♀ is decidedly the best imitator of an ant that could be imagined, so far as mere appearance goes, but still there is something about its movements that should to the human eye prevent any mistake as to its real character.

Distribution. It is distributed throughout Europe, and is recorded from Egypt. In Britain it has occurred in nine English counties, viz. Lincs, Norfolk, Suffolk, Cambs, Kent, Surrey, Sussex, Hants, and Somerset. The only Welsh record is from Carmarthen, where I found it on the Kidwelly sandhills. It is not recorded from either Scotland or Ireland.

Division *b*. *MACROLOPHARIA.*

This division has not so many genera as the Cremnocephalaria, and the majority are American; only six genera with twenty-eight species are Palaearctic, and in Britain we have three genera with nine thin and delicate species. All but one are inhabitants of low plants, unlike the preceding group, and none are myrmecophilous. Our three genera may be thus distinguished:

1. (4) Eyes remote from pronotum
2. (3) Head not constricted behind eyes; eyes small . . . 1. *Macrolophus.*
3. (2) Head constricted behind eyes; eyes large . . . 2. *Dicyphus.*
4. (1) Eyes touching pronotum . . . 3. *Campyloneura.*

325. **Macrolophus nubilus** H.S.

H.S. Panz. F.G., 135, 9 (1805); D. & S., B.H. 382 (1865); Saund., H.H.B.I. 271 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to August.

Habitat, etc. It is found most frequently on bramble, but it occurs also on *Stachys sylvatica*, and according to Reuter on *Urtica*. E. P. Collett records it from bracken, and I have swept it, especially in the evening, from brambles growing under fir trees. Reuter reports it also from *Inula graveolens* and *Ononis natrix*. When taken on bramble it is rather larger than on *Stachys*, but I have not been able to find any other difference.

Distribution. It is recorded from Europe generally and from Algeria, Tunisia, and the Canary Is. In Britain it is reported from fifteen English counties, viz. Cumberland, Durham, Notts, Leicester, Norfolk, Glo'ster, Oxon, Bucks, Herts, Middlesex, Essex, Kent, Surrey, Sussex, and Somerset; there are Welsh records from Carmarthen and Glamorgan, and it is reported from Scotland, but not from Ireland.

326. **Dicyphus constrictus** Boh.

Boh. Öfr. V.A. Förh., 74 (1852); Saund., H.H.B.I. 273 (1892).

Ova. Unknown.

Larvae. The larva of *D. constrictus* very closely resembles that of *D. stachydis*. It is of a very pale green colour, with legs almost colourless; instar for instar, it is of course a little larger than *D. stachydis*, with slightly longer and thinner legs. The most reliable means of distinction is apparently to be found in the setae of the hind tibiae ; these are longer, stouter, and darker than those of *D. stachydis*, the latter being indeed rather difficult to see, while the former are very plain.

Life-cycle. The imago is found from July to September.

Habitat, etc. I have almost always found this species on *Lychnis dioica*, especially where the plant grows in shady woods. Reuter, however, does not give this plant at all, but instead *Melandryum pratense*, *Symphytum*, *Aconitum lycoctonum*, and *Rubus idaeus*, J. Sahlberg gives *Urtica dioica*, and Carr *Digitalis purpurea*. Only two of Reuter's list are British plants, so that, apparently, the insect is able to adapt itself to varying botanical conditions, according to locality. The ♂ is macropterous, and the ♀ dimorphous, the brachypterous form being much the commoner.

Distribution. This insect does not seem to be at all widely distributed ; outside of Britain it is recorded only from Scandinavia, Finland, N. Russia, and Croatia. In Britain it has been found in thirteen English counties, viz. Yorks, Lancs, Notts, Lincs, Northants, Essex, Surrey, Sussex, Hants, Berks, Wilts, Devon, and Cornwall ; in Wales it is recorded from Carnarvon, Carmarthen, and Glamorgan, and it is found in Scotland, but is not reported from Ireland. Probably it is often passed over because of its resemblance to other species ; personally I have never found it uncommon, but generally to be discovered where the *Lychnis* grows in damp, shady woods.

327. **Dicyphus epilobii** Reut.

Reut., E.M.M., xx, 52 ; D. & S., B.H. 380 (1865) (pallidus) ; Saund., H.H.B.I. 272 (1892).

Ova. Unknown.

Larvae. 2nd instar, or perhaps first, 1 mm. Very delicate greenish-white, basal joint of antennae more or less red, other joints slightly fuscescent ; antennae longer than body ; legs rather long, tarsi two-jointed, basal joint extremely small, terminal very long (this is characteristic of the whole genus) ; body elongate, furnished dorsally with long, whitish hairs.

3rd instar, $1\frac{3}{4}$–2 mm. As before, but with merest rudiments of wing-pads visible ; antennae with basal joint red, next two flavous, terminal fuscescent ; apical half of second tarsal joint fuscescent ; dorsal hairs very long ; pronotum considerably narrower than either head or body.

4th instar, 3 mm. Similar to above, but with larger wing-pads.

5th instar, 4 mm. Similar to above, but with wing-pads extending half-way down abdomen.

The red basal joint of antennae, and the comparatively short antennae, seem to be the best distinguishing features of this larva.

Life-cycle. The imago may be found from July to October, but specimens have also occurred in November and December. The majority mature in late July or the beginning of August, but notwithstanding this the above larvae were found about the middle of August, in company with many perfect insects.

Habitat, etc. This species is confined to *Epilobium hirsutum*, on which it is usually extremely abundant and to which it is absolutely faithful. It appears to be always macropterous in both sexes.

The abdomen in the ♀ near its end is deeper than in any of the other species ; possibly this may result from the size of the saws.

Distribution. This insect, so common with us, seems to have no very wide distribution outside the British Isles ; it is recorded from Central and Southern Europe only. In Britain it is recorded from thirty English counties, i.e. all except Westmorland, Staffs, Salop, Hunts, Rutland, Beds, Northants, Warwick, Worcester, and Monmouth ; Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland. Wherever *Epilobium hirsutum* occurs, this species may be expected to be in abundance.

328. **Dicyphus errans** Wolff.

Wolff., Ic. Cim., 161, t. 16, fig. 155 (1802) ; D. & S., B.H. 379 (1865) ; Saund., H.H.B.I. 273 (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Elongate, greenish ochreous, with fore parts more or less rufescent ; basal antennal joint red ; base of pronotum nearly as wide as wing-pads ; the latter very long, reaching beyond base of posterior femora ; faint traces of spots on intermediate and posterior femora ; first tarsal joint minute, second very long, with its apical half fuscous ; apical joint of antennae slightly infuscated ; dorsal surface with a few long whitish hairs.

Life-cycle. The imago is found from June to September, and on the Continent it has been met with in November. The larva above described was taken on the 21st August.

Habitat, etc. This species is found with us, chiefly, I believe, upon nettles, though many other plants are mentioned, either here or on the Continent. Thus Douglas and Scott give *Stachys sylvatica* and *Epilobium*, Morley *Chamomile*, Reuter *Volcameria*, *Scrophularia glandulosa*, *S. verna*, *Geranium robertianum*, *Erodium cicutarium*, *Paulownia rectiflora*, *P. glutinosa*, and Fallén alders.

This species is generally macropterous in both sexes, but Saunders reports two brachypterous ♀♀ from Ilfracombe in September ; this form is, however, very rare.

Reuter describes the following varieties :

(*a*) Ochraceo-cervinus, capite superne vittis duabus antice divergentibus, clypeo lateribusque late nigris, prothorace lateribus angulisque posticis pronoti, scutello macula utrinque vittaque media, commissura hemielytrorum et punctis duobus apicalibus corii fuscis; hemielytris saepe seriatim fusco-punctatis, punctis piliferis; pectore lateribus vel toto ventreque marginibus segmentorum vel toto piceis, nitidissimis. Long ♂ ♀ 5–5¾ mm.

(*b*) Capite ut in praecedente vel piceo-nigro, solum orbitis pallidis pronoto, pectore, orificiis exceptis, abdomineque toto piceo-nigris nitidissimis, scutello fusco-nigro, opaco, vitta media pronoti plerumque virescenti-pallida, scutello pone medium utrinque gutta ochracea; hemielytris obscurius cervinis, vena cubitali corii plerumque infuscata. Long ♂ ♀ 5½–6¾ mm.

Distribution. It is found in the greater part of Europe and in Algeria. In Britain, it has been recorded from twenty-three English counties, viz. all the coast counties from Northumberland to Glo'ster except Lincs, together with Westmorland, Notts, Hunts, Hereford, Oxon, Herts, Surrey, Berks, and Wilts; the Welsh records are from Carmarthen and Glamorgan, and it is reported from Scotland, but not from Ireland.

329. **Dicyphus stachydis** Reut.

Reut., E.M.M., xx, 53; Saund., H.H.B.I. 274 (1892).

Ova. On May 24th, 1915, I took two dark gravid ♀♀ on *Stachys sylvatica*, apparently over-wintered examples, and enclosed them in a tube with *Stachys* leaves, hoping to get eggs. On June 14th several young ones appeared, the parents having already died. Evidently, therefore, eggs had been laid, though I was quite unable to find them.

Larvae. The young larva has a length just over 1 mm. and is cylindrical, abruptly pointed behind, entirely clear yellow, with large red eyes; legs and antennae long, almost colourless; body with a few long pale hairs.

Penultimate instar, 2–2½ mm. Green, with legs greenish ochreous and with basal antennal joint reddish or fuscous in the centre, terminal joint slightly infuscated; body with long pale hairs; basal joint of tarsi minute, terminal joint very long, with apical third more or less infuscated; claws red; rudiments of wing-pads minute.

Last instar, 3–3½ mm. Greenish ochreous with head slightly rufescent; in other respects as above, but with about half of apical joint of tarsi strongly infuscated, and with a row of small tubercles on upper surface of intermediate and posterior femora, wing-pads not reaching base of hind femora. This species may be distinguished from the two preceding by the smaller size and shorter legs, antennae and wing-pads; in other respects they are very much alike.

Life-cycle. This imago may be found in the open from May to October, but those found in the spring and early summer are considerably darker than those that mature in late July or early August, and are probably over-wintered examples. As shown above, gravid ♀♀ may be found in May, and these produce eggs which hatch in about a fortnight; the larval existence usually lasts from the middle of June till towards the end of July. I do not think that the ♂ is to be met with in spring, so that impregnation probably occurs in the autumn, although the eggs may not be laid till the following spring.

Habitat, etc. This species is practically confined to *Stachys sylvatica*, on which plant it may usually be found wherever it grows; Morley records it from nettles also, but this is a plant which often grows mixed with *Stachys*. In Mulgrave Park, near Whitby, I found larvae which I cannot distinguish from this species on *Circaea lutetiana*, and Prof. Carr gives *Ononis*; Mr. W. E. Evans, of Edinburgh, has found it in the Lothians on *Mercurialis perennis*, *Lychnis*, *Lamium album*, and *Scrophularia aquatica*.

It is usually brachypterous in both sexes, and the macropterous forms of both, but especially the ♂, are rare.

Reuter describes the following two varieties, of which the first represents the autumn forms of the year, and the second the spring examples, which appear to be over-wintered and to have darkened their colour and increased their size during their retirement.

> (*a*) Pallide stramineo-cervinus, inferne plerumque magis minusve piceo-variegatus, interdum pectore abdomineque totis nigro-piceis, capite pallido, parte postoculari lateribus, clypeo, vittis frontis punctisque duobus verticis piceis; callis pronoti plerumque lateribus punctis nigris; hemielytris cervinis, unicoloribus, vel apice cunei rufo-castaneo aut griseo, interdum etiam corio ad apicem venae cubitalis puncto griseo.
>
> (*b*) Corpore inferne nigro-piceo, pectore saepe lateribus praecipue circa orificia metasterni ochraceo, superne cum hemielytris obscure fuliginoso-fusco, pronoto interdum pallidiore; capite semper obscure et sordide ochraceo, ut in var. (*a*) signato, signaturis autem magis confluentibus.

It must be admitted that, though these first four species are pretty easily distinguished in the adult condition, their separation in the larval state is by no means easy, and perhaps the best guidance is given by the food-plants, viz. *Lychnis* for *D. constrictus*, *Epilobium* for *D. epilobii*, nettles for *D. errans*, and *Stachys* for *D. stachydis*. There is much less difficulty with the next three species.

Distribution. This species is recorded from Europe generally, and from Algeria and Western Siberia. In Britain it is recorded from twenty-four English counties, viz. the coast counties from Durham to Sussex, together with Cumberland, Cheshire, Notts, Cambs, Hunts, Warwick, Hereford, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset; from Wales in the counties of Carnarvon, Radnor, Carmarthen, and Glamorgan, and from both Scotland and Ireland.

330. **Dicyphus pallidicornis** Fieb.

Fieb. Eur. Hem., 324, 1 (1861); D. & S., B.H. 375 (1865) (pallicornis); Saund., H.H.B.I. 275 (1892).

Ova. Cylindrical, much bent in the middle, where it is widest; truncated anteriorly, rounded posteriorly; collar slightly excavated from side to side; colour pale yellow.

Larvae. This larva is very much like the preceding, but may be distinguished by its smaller size, broader body, and shorter antennae and legs.

Last instar, 2¾ mm. Greenish ochreous, with the dark contents of abdomen showing through; eyes reddish-black; apex of first antennal joint red, terminal joint slightly infuscated; dorsal surface, especially of abdomen, with long pale hairs; apex of tarsi fuscous; the usual minute basal and very long apical joint; wing-pads reaching base of hind femora.

Preceding instar, 2¼ mm. Similar to above, but with wing-pads not reaching beyond intermediate femora.

Life-cycle. The imago is found from May to October on the leaves of foxgloves. Buchanan White says: " It may be found from May to October, and larvae have been noticed at various periods from June to September. But I have discovered it hibernating in winter at the roots of foxgloves, and it is probably to be met with nearly all the year round." I can confirm this hibernation.

Habitat, etc. It feeds on *Digitalis purpurea*, and should be looked for chiefly on the underside of the leaves. Buchanan White says: " This insect seems to be never found on any plant but *Digitalis*, though I have reason to suspect that it may occasionally be found on Mullein (*Verbascum thapsus*)."

It is subject to the attacks of parasites. I took a ♂ specimen with greatly distended body near Hyde Heath, Chiltern Hills, Bucks, August 14th, 1915. I enclosed it in a tube with a leaf of foxglove, and on the 16th I found it had voided a large apodal grub, very much like that previously recorded for *Calocoris fulvomaculatus*. The next day this grub was much reduced in dimensions, and there was in the tube a good deal of moisture in which the *Dicyphus* was entangled. Previously to this the bug had seemed no worse for its experience, but rather to be relieved; but after its wetting it became very feeble, and died the next day. Meanwhile the grub also shrivelled up and died, leaving its identity undetermined.

Reuter describes three varieties of this insect:

> (*a*) Pallide ochraceus vel stramineus, capite lateribus, clypeo, vittis duabus frontis cum punctis verticis duobus conjunctis, prothoracis vitta epimerorum, mesosterno vel pectore toto, interdum etiam abdomine

piceis; callis pronoti plerumque ferrugineo-conspersis, lateribus piceis; scutello fere semper vitta lata media punctoque utrinque fuscis; corio saepe in venis rufescenti- vel fuscescenti-tinctis, cuneo apice castaneo. ♂♀.

(*b*) Capite ut supra; pronoto piceo, margine apicali vittaque obsoleta disci pallidis, scutello fusco, solum gutta utrinque ochracea, hemielytris sordide pallidis, clavo ad marginem scutellarum (*sic*) et commissuram corioque versus apicem vittis duabus obliquis nec non sutura membranae fuscis. ♂♀.

(*c*) Ut praecedens, sed hemielytris totis fuligineo-fuscis, cuneo formae macr. albido, $\frac{2}{5}$ apicalibus castaneo-nigris. ♂ macr., ♀ brach.

The insect is dimorphous in both sexes, but with us the macropterous form is by far the more usual. Sometimes, however, almost all the specimens on a particular plant will be brachypterous; this was the case at Aislaby, Yorks, where I found this species in August, 1914. The brachypterous form superficially resembles the ordinary form of *D. stachydis*, but may be distinguished by its shorter body, legs, and antennae, and its rather broader and more robust appearance.

Distribution. This species is not very widely distributed outside the limits of the British Isles. It is recorded from Central and Southern Europe and from Algeria. In Britain it has been recorded from twenty-five English counties, viz. all the coast counties from Northumberland to Hants, except Lincs, together with Cumberland, Lancs, Cheshire, Staffs, Derby, Notts, Hereford, Monmouth, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, Devon, and Cornwall, from the Welsh counties of Carnarvon, Carmarthen, and Glamorgan, and from both Scotland and Ireland. With regard to Scotland, Buchanan White says: " Wherever the common foxglove grows throughout Scotland this species appears to be found. I have noticed it at an elevation of 1100 feet."

331. **Dicyphus globulifer** Fall.

Fall. Hem. Suec., i, 124, 18 (1829); D. & S., B.H. 377 (1865); Saund., H.H.B.I. 275 (1892).

Ova. Unknown.

Larvae. Last instar, 3 mm. Greenish ochreous, with abdomen more or less darkened by its contents, which appear through the skin; antennae short and robust, with first joint, base and apex of second, apical half of third and whole of fourth piceous, the rest ochreous; whole dorsal surface furnished with strong and rather long black hairs; head with central lobe of face and an inverted **V**-shaped mark above it piceous; pronotum trapezoidal and transverse, with apical margin much narrower than basal; scutellum dark, wing-pads rather long, darkened at apex; body rather broad, oval; femora with dark spots, tibiae black at extreme base and apex, and with black hairs outwardly, tarsi with apical half of very long second joint black, claws small, arolia distinct. The cast skin shows that the black hairs arise from black points, and the fore parts and legs are more or less infuscated. The broad and robust form of this insect, together with the conspicuous black hairs, enable it to be easily distinguished from the other species.

Life-cycle. The imago occurs with us from May to September, and there is a continental record for October. I have on two occasions found larvae in company with imagines in August, but usually the insects are already fully matured by the beginning of that month. On the analogy of the preceding insect one might expect the hibernation of the imago in this case also, but there is no definite evidence save the occurrence of the imago in May, by which time I believe no larvae can be discovered.

Habitat, etc. I have always found this insect on *Lychnis dioica;* in Scotland it is reported by Norman from *L. vespertina.* Reuter, however, gives several other plants on which it has been found, viz. *Dianthus, Melandryum pratense, Lychnis rubra, Silene, Ononis campestris, Pteris aquilina, Athyrium filix-femina.* It often delights in *Lychnis dioica* when that plant grows in damp, shady woods, and is consequently paler in flower and more elongate in growth than when it is found in the open. But at the same time I have found it in the North of England equally abundant on the same plant in its more robust form as it grows in open hedges. The insect is gregarious, and is generally abundant where it occurs. It is always macropterous. A dark variety occurs, which Reuter thus describes: "Obscurior, pronoto toto, clavo, corio limbo laterali excepto apiceque cunei latius piceo-nigris, tibiis ipsa basi piceo-nigra."

Distribution. It is found throughout Europe and in the Caucasus and Algeria. In Britain it is reported from twenty-seven English counties, including all the coast counties from Northumberland to Glo'ster, together with Cumberland, Lancs, Notts, Leicester, Cambs, Warwick, Hereford, Oxon, Herts, Surrey, Berks, and Wilts; and Wollaston records it from Wales, but without definite locality, but there is a record from Pembroke. Norman took it in Scotland, but there is no Irish record.

332. **Dicyphus annulatus** Wolff.

Wolff, Ic. Cim., 162, t. 16, fig. 156 (1802); D. & S., B.H. 376 (1865); Saund., H.H.B.I. 276 (1892).

Ova. Unknown.

Larvae. 2nd instar, probably, 1¼ mm. Similar in shape to adult. Greenish-grey, more or less marked with fuscous, especially in centre of abdomen; head and pronotum with black spots symmetrically arranged, the latter with a pale stripe down the middle; antennae stout and entirely fuscous; hind tibiae with strong black hairs springing from black spots.

A number of minute black spots symmetrically arranged on the abdomen, from each of which springs a black hair. These become much more distinct in later instars.

Next instar, 1¾ mm. Paler in colour. Vertex of head with six black spots placed in a semi-circle, surrounding a centrally placed fuscous anchor-shaped mark arising from the fuscous fore part of the head ; the whole body ornamented with black spots arranged in transverse rows, of which each segment of the abdomen has one near to its margin, and from each black spot springs a large black hair ; second joint of antennae showing a pale ring in the centre ; wing-pads just beginning to appear, small and rounded.

Last instar, 2¼ mm. Similarly marked, but with wing-pads much longer, extending more than half-way down the body ; femora spotted ; basal joint of antennae pale at base and apex ; legs becoming more hairy ; the anchor-shaped mark on the head has now become more tree-like.

Life-cycle. The imago occurs from June to November. Larvae mixed with imagines may still be found in August and September, but the majority have matured by the end of July. The occurrence of the imago so late as November is a suggestion of hibernation, though in that case one would have expected somewhat earlier records for over-wintered specimens.

Habitat, etc. It occurs on *Ononis*, especially in sandy places on the coast, and in this country seems to be confined to that plant. Reuter, however, gives also *Salvia officinalis*, *Linaria spuria*, and *Inula graveolens*. He also states that it has been found in the Department of Oise in France on *Pinus* from July to September, which can hardly be for hibernation purposes, and also in North-west France on *Pinus pinaster*.

Distribution. It occurs in Central and Southern Europe, North Africa, and Syria. In Britain it has been recorded from fifteen English counties, viz. Northumberland, Durham, Yorks, Leicester, Norfolk, Suffolk, Glo'ster, Bucks, Herts, Essex, Kent, Surrey, Hants, Dorset, and Devon, ten of which are littoral ; the Welsh records are from Carmarthen and Glamorgan, and it has been found in Scotland, but not in Ireland.

333. **Campyloneura virgula** H. S.

H.S. Wanz., iii, 51, fig. 268 (1836) ; D. & S., B.H. 373 (1865) ; Saund., H.H.B.I. 276 (1892).

Ova. Unknown.

Larvae. Last instar, 3 mm. Shape subfusiform. Yellow with outer margin of pronotum crimson, the latter colour being continued as a streak along the inner margin of the eye and also along the outer margin of the wing-pads ; wing-pads long, very slightly fuscescent ; antennae with first joint crimson, second more or less of the same colour, third and fourth

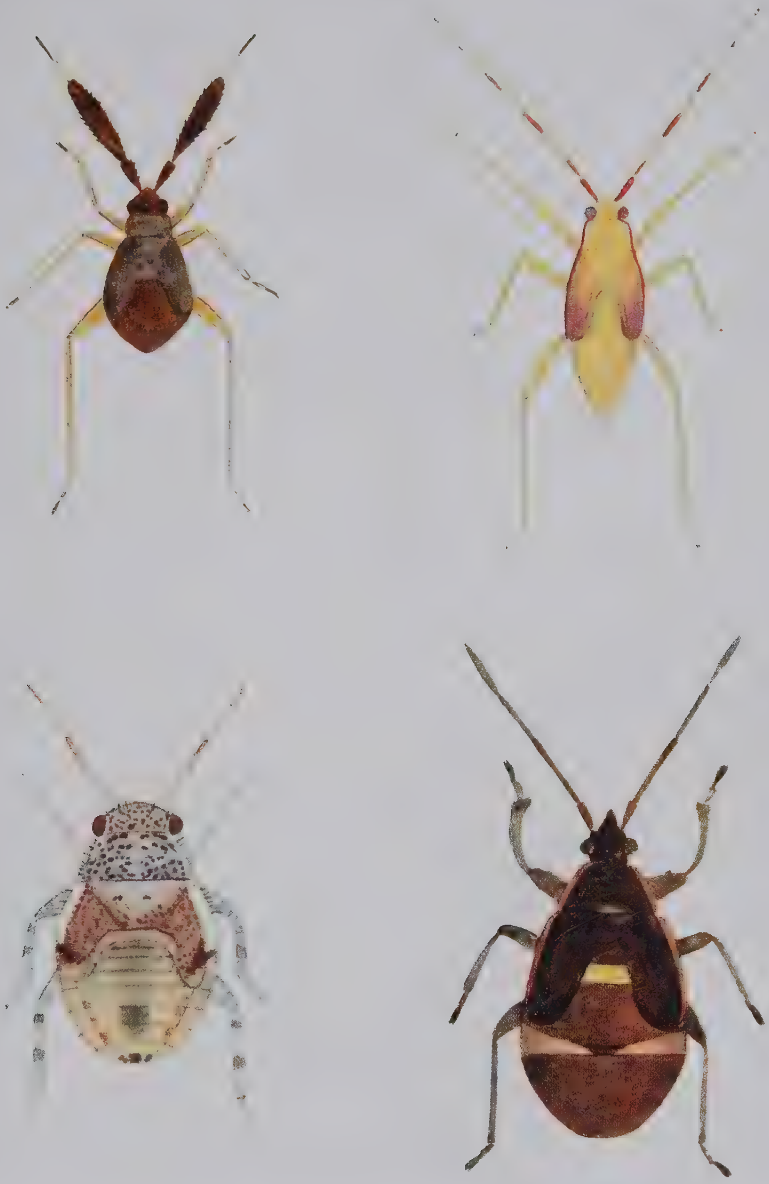


PLATE V.

NYMPHS OF HEMIPTERA-HETEROPTERA.

1. Heterotoma merioptera Scop. × 9.
2. Campyloneura virgula H.-S. × 10.
3. Camptobrochis lutescens Schill. × 11.
4. Gastrodes ferrugineus L. × 9.

E. A. Butler del.

crimson at base, and the latter also at apex ; legs yellow, hind femora more or less red at apex ; extreme apex of second tarsal joint and claws fuscous ; a few long pale hairs distributed over the dorsal surface. The shape and coloration of this insect will easily distinguish it.

An earlier instar, 2 mm. Bright canary-yellow, with red markings as above ; wing-pads short ; eyes less prominent. The yellow colour and red marking on this insect enable it to be recognised without difficulty.

Life-cycle. The imago occurs in the open from July to October, but a few larvae may still be found in August. On the Continent it is said to hibernate in moss.

Habitat, etc. This is an arboreal species ; it lives on oak, beech, hornbeam, poplar, ash, hazel, sallow, holly, and juniper, and I believe also on hawthorn. In addition to these trees Reuter gives three species of honeysuckle, *Lonicera etrusca*, *L. caprifolium*, and *L. sempervivens*. D'Antessanty, according to Reuter, found it abundantly in spring over-wintering in moss.

Distribution. It is found in Europe generally, and also in Algeria, Tunisia, and Turkestan. In Britain it is recorded from twenty-seven English counties, including all the coast counties from Lincs to Glo'ster inclusive, as well as Cumberland, Derby, Cheshire, Notts, Leicester, Cambs, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; the Welsh records are from Brecknock, Carmarthen, and Glamorgan, and it has been found in both Scotland and Ireland.

Sub-Family V. **Heterotomina.**

The Heterotomina, which have no pronotal ring, and no hamus to the wing-cell, contain a large number of genera of world-wide distribution. Of these our British Fauna can boast only fifteen, which are very unequally assigned to its two divisions.

Divisions of the Heterotomina.

1. (2) Body, at least of ♀ generally broad oval ; genae high ; posterior femora dilated *HALTICARIA.*
2. (1) Body generally oblong or elongate ; genae low ; posterior femora not dilated[1] *HETEROTOMARIA.*

Division *a.* *HALTICARIA.*

This division contains a few species, chiefly black, and possessed of some slight saltatorial power. They are all associated with low plants, and especially *Rubiaceae*, and are therefore generally taken by sweeping. They form a very meagre selection from the Palaearctic representatives of this section, one hundred species of which are catalogued in Oshanin's List. The three genera may be distinguished as follows :

---

[1] Except in Orthotylus ericetorum.

1. (2) Head not overlapping front of pronotum	1. *Orthocephalus.*
2. (1) Head partly overlapping front of pronotum	
3. (4) Antennae not so long as body	2. *Strongylocoris.*
4. (3) Antennae nearly twice as long as body	3. *Halticus.*

334. **Orthocephalus saltator** Hahn.

Hahn, Wanz., iii, 11, fig. 236 (1835) ; D. & S., B.H. 431 (1865) ; Saund., H.H.B.I. 270 (1892).

Ova. Unknown.

Larvae. " Nympha : Statura imagini similis, tota nigra, nitida, nigropilosula, tibiis etiam nigris ; capite basi pronoti latiore mesonoto pronoto paullo breviore ; rudimentis alarum brevioribus, basin dorsi tantum paullo superantibus ; antennis quam imaginis brevioribus " (Reuter, 2). It is curious that the tibiae show no trace of the pale colour which distinguishes the imago, but are as dark as those of the next species. The antennae are very slightly browned. Length 3 mm.

Life-cycle. The imago is found from June to September. I have received from Mr. T. Edmonds, larvae in their last instar taken on July 9th, 1916.

Habitat, etc. The insect occurs by sweeping, according to Saunders, on *Trifolium*, *Ononis*, etc., and to Reuter (12) on *Vicia cracca*, *Chrysanthemum*, and *Thymus serpyllum.* I have found it also on coast sandhills at Ferryside and Pendine, Carmarthenshire. These sandhill specimens are more densely clothed with white scales than usual, but this may have been because they had not long matured, as the scales are very easily detached, and older specimens have generally but few remaining. Whittaker (1) describes it from dwarf sallow, Morley (4) describes it as occurring in marshes, and Parfitt states that he found it under dry weeds and rubbish on the seashore.

The insect is pterygo-dimorphous in the ♀, the brachypterous form being by far the more frequent. Reuter (12) describes two forms of the brachypterous ♀, one with the hemielytra as long as the abdomen and with a small membrane, the other with hemielytra shorter and with no membrane.

This insect possesses a slight amount of leaping power, at least in the ♀.

Distribution. It is found over the whole of Europe up to 65° N. lat. and in Algeria, Asia Minor, Siberia, and N. America. In Britain it is recorded from twenty English counties, viz. all the coast counties from Lincs to Glo'ster, together with Cumberland, Durham, Lancs, Cheshire, Oxon, Herts, Surrey, and Berks ; the Welsh records are from the counties of Carnarvon, Merioneth, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

335. **Orthocephalus mutabilis** Fall.

Fall. Mon. Cim., 98, 4 (1807); D. & S., B.H. 430 (1865); Saund., H.H.B.I. 270 (1892).

Ova. Unknown.

Larvae. Last instar, 3½ mm. Very similar to the preceding species, entirely shining black; broader and more hairy than *O. saltator*, centre of abdomen slightly tinged with red; antennae and legs stouter, femoral hairs longer and much coarser, tibial hairs more numerous and very closely set; whole insect rather larger; outer limb of wing-pads very slightly tinged with brown.

Life-cycle. The imago is found fom June to September; I took larvae in their last instar on June 21st, 1913.

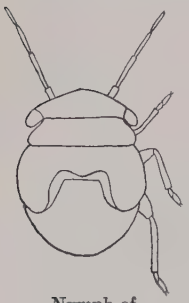
Habitat, etc. This species also is taken by sweeping; it is recorded from *Tanacetum*, and *Ononis* (Norman), to which Reuter (12) adds *Centaurea scabiosa, Cardui, Spartium scoparium*, etc.

Distribution. It is recorded from all parts of Europe and from Algeria. In Britain it is much less widely distributed than the preceding species, being recorded from only twelve English counties, viz. Norfolk, Suffolk, Glo'ster, Oxon, Bucks, Surrey, Sussex, Hants, Berks, Wilts, Dorset, and Devon; the only Welsh record is from Glamorgan, and it is found in Scotland, but not in Ireland.

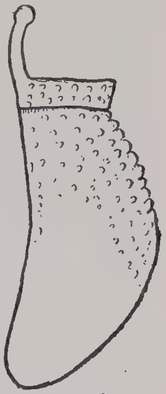
336. **Strongylocoris leucocephalus** Lin.

Lin., F.S., 940 (1761); D. & S., B.H. 482 (1865); Saund., H.H.B.I. 269 (1892).

Ova. Length ⅔ mm. Short and stout, slightly concave on one side, and strongly convex on the other; a short collar, running out on the concave side into a curved process as long as the collar is wide; colour brownish-yellow, the collar and the surface of the chorion nearest to it covered with minute tubercles.



Nymph of *Strongylocoris leucocephalus* L.



Egg of *Strongylocoris leucocephalus* L.

Larvae. "Nympha crassa ferruginea" (Reuter, 2). To which may be added:

Last instar, length 2 mm. Ochraceo-ferruginous, more or less infuscated, head often entirely yellow, apex of wing-pads always dark; generally quite black; head very broad, with eyes largely overlapping pronotum, triangular; pronotum transverse, with anterior angles much rounded; body very short and broad; wing-pads projecting beyond line of body; antennae four-jointed, first two joints more or less ochreous, third and fourth brown or blackish; length of joints beginning with shortest, 1, 4, 3, 2; legs yellow, apex of tibiae often infuscated, tarsi dark; whole surface glabrous; spines to tibiae short.

Previous instar, length 1½ mm. Similar, but with very short wing-pads. The short, stout body, and large triangular head will easily distinguish this larva.

Life-cycle. The imago has been taken from May to August; the larvae above described were captured May 31st, 1919, and I have found the imago most common in June.

Habitat, etc. This species occurs on *Vicia cracca* (Douglas and Scott, 1), and according to Reuter (12) on *Galium verum*, *Urtica dioica*, *Campanula rotundifolia*, and *C. rapunculoides*. Norman found it on *Galium* in Scotland, and Dalla Torre gives *Galium erectum*. Collins thinks it is attached to *Helianthemum*, and I have swept it from grassy slopes at Box Hill, where *Helianthemum* grows in abundance. At Scarborough, Wilkinson found it amongst the short grass on the top of the cliffs (Douglas and Scott, 1). I have taken it in Switzerland by sweeping in rather marshy meadows at a height of about 3000 feet.

Reuter (12) gives the following varieties:

> (*a*) *steganoides* J. Sahlb. Minor, capite toto coxisque posterioribus piceis vel obscure piceo-ferrugineis; pectore toto nigro vel medio piceo. Long. 3⅗–4½ mm. (This is sometimes regarded as a distinct species.)
>
> (*b*) *sibiricus* Reut. Capite corpori toto concolore, nigerrimo. Long. 4–5 mm.

Distribution. *S. leucocephalus* is found throughout the whole of Europe, and in Siberia (var. *sibiricus*), China, Asia Minor, and Algeria. In Britain it is not by any means a common insect; it is recorded from twelve English counties, viz. Northumberland, Cumberland, Durham, Yorks, Norfolk, Glo'ster, Oxon, Surrey, Hants, Berks, Wilts, and Dorset, and it is found in Scotland, but there are no records from either Wales or Ireland.

337. **Strongylocoris luridus** Fall.

Fall. Mon. Cim., 94, 78 (1807); Saund., H.H.B.I. 269 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to August.

Habitat, etc. It is recorded from the flowers of *Jasione montana* at Weybridge, and Reuter (12) adds *Galium*, *Calluna*, and "in gramine locis aridis." Mr. Jas. Murray has recently taken a specimen near Carlisle from amongst a mixture of nettles, docks, and lady ferns.

Distribution. It is recorded from Europe generally, and from Morocco. In Britain it is a rare species, and has occurred chiefly in a compact little district in the south of England, comprising the three counties—Surrey, Hants, and Dorset. The only record that I know of outside this area is Cumberland, as above.

338. **Halticus luteicollis** Pz.

Panz., F.G., 93, 18 (1805) ; D. & S., B.H. 480 (1865) ; Saund., H.H.B.I. 267 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to August.

Habitat, etc. This species frequents various species of *Galium*, such as *G. ochroleucum* ; the var. *propinquus* is found on *Galeopsis versicolor*. Morley (4) records the typical form from hazel ; Douglas and Scott (1) by sweeping clover, and Collins from honeysuckle. It is very active and makes short leaps.

The var. *propinquus* H.S. is thus described by Reuter (12) :

"Pronoto toto femoribusque versus basin late nigris."

Distribution. It is found over the whole of Europe, as well as in Asia Minor. In Britain it is less common than *H. apterus*, being recorded from only ten English counties, viz. the five coast counties from Suffolk to Hants, together with Cambs, Glo'ster, Oxon, Surrey, and Berks ; the only Welsh record is from Glamorgan, and it has not been met with in either Scotland or Ireland ; hence its northernmost limit is Suffolk.

339. **Halticus saltator** Geoffr. in Fourcr.

Geoff. in Fourcr. Ent. Par., 218 (1785) ; Ent. Rec., xxiii, 234.

As this species has been added to our fauna since the publication of Saunders' "Hemiptera-Heteroptera of the British Islands," a brief diagnosis is here appended.

Very similar to *H. apterus*, but with rather larger head, which is rufo-testaceous ; legs luteous, with only posterior femora black except at apex ; it is not quite so shining as *H. apterus* and has a stronger pubescence which is golden. It is also slightly larger, the brachypterous form measuring $2\frac{2}{3}$ mm. Like *H. apterus*, it is pterygo-dimorphous.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in September.

Habitat, etc. Donisthorpe took his specimens (see below) while sweeping *Mercurialis annua* ; on the Continent it occurs on *Althaea rosea*, and on *Echium vulgare*. Kirschbaum records that in the former case it produces by its punctures a deformity of the leaves. It is also destructive to cucumber plants.

It has a variety which is thus described by Reuter (12) :

"Etiam fronte medio picea ; femoribus ipso apice excepto nigris, tibiis posticis basi late nigro-piceis."

Distribution. It is found in Central and Southern Europe. In Britain two examples were taken by Mr. Donisthorpe at Deal on September 6th, 1907, and are now in the University Museum, Oxford. There is a long series of specimens of both sexes in the British portion of the Hope Collection at the same museum, but Prof. Poulton tells me that nothing is known as to the locality in which they were taken. I understand, however, that they are undoubtedly British.

340. **Halticus apterus** Lin.

Lin., F.S., 894; D. & S., B.H. 479 (1865) (pallicornis); Saund., H.H.B.I. 268 (1892).

Ova. Unknown.

Larvae. "Nympha nigra nitida, laevis, pronoto et capite parce nigropilosis, antennis pedibusque flavis, femoribus posticis apice excepto, tibiis posticis a basi ultra medium apiceque tarsorum omnium nigris" (Reuter, 2).

It is curious that the black colour of the posterior tibiae, which is very marked in the nymph, quite disappears in the imago. The shape of the nymph is so similar to that of the imago that it cannot be mistaken.

Life-cycle. The imago is found from June to August.

Habitat, etc. It occurs in grassy and flowery places on a sandy or chalky soil, and according to Reuter (12) its food-plants are *Galium verum*, *Vicia cracca*, *Ononis*, *Spartium*, etc. Morley (4) also has found it on *Ononis*, Douglas and Scott (1) add *Centaurea*. It is pterygo-dimorphic, but with us is almost always brachypterous in both sexes, the hemielytra being devoid of membrane and having the cuneus abbreviated and indistinct. The macropterous form is very seldom met with in this country, but I have found it not uncommon in Switzerland.

It has considerable leaping power, and this no doubt helps to compensate for loss of the power of flight in the brachypterous forms. Poulton regards it as a mimic of the beetle *Apteropeda orbiculata*, in company with which it is sometimes taken; the long legs and antennae of the bug do not interfere with the mimicry, as in consequence of their very pale colour, they are almost invisible, and the insect appears as a roundish black bead.

Distribution. It is found over the whole of Europe up to 62° 30′ N. lat., and also in Algeria, Siberia, and Turkestan. In Britain it cannot be called a common species; it is recorded from only twelve English counties, viz. the coast counties from Norfolk to Dorset except Hants, together with Cambs, Oxon, Herts, Middlesex, Surrey, and Berks; the only Welsh record is from Glamorgan, and it has not been found at all in either Scotland or Ireland. Thus its northernmost limit is Norfolk.

Division *b*. *HETEROTOMARIA.*

The Heterotomaria contain a very large number of genera which are distributed over all quarters of the globe; the Palaearctic Fauna as enumerated in Oshanin's Catalogue under the name Cyllocoraria, contains over 110 species, of which our British representatives are 37, distributed in 12 genera; this section is therefore fairly well represented with us, with about one-third of the whole Palaearctic contribution. The insects are diversified in habits, some being arboreal, and others occurring on bushes and low plants, or even on the ground.

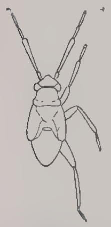
1. (2) Head overlapping pronotum 1. *Pilophorus.*
2. (1) Head not overlapping pronotum
3. (4) Insect elongate, 7 mm. 2. *Cyllocoris.*
4. (3) Insect less than 7 mm. long
5. (6) Third and fourth joints of antennae not thinner than apex of second 3. *Aetorhinus.*
6. (5) Third and fourth joints of antennae thinner than second
7. (8) Callosities of pronotum very prominent; second joint of antennae much longer than third and fourth together 4. *Globiceps.*
8. (7) Callosities of pronotum not very prominent
9. (18) Second joint of antennae not longer than, usually not so long as, third and fourth together
10. (13) Head vertical or nearly so
11. (12) Sexes very dissimilar 5. *Mecomma.*
12. (11) Sexes not very dissimilar 6. *Cyrtorrhinus.*
13. (10) Head not vertical
14. (17) Eyes touching pronotum, or nearly so
15. (16) Third and fourth joints of rostrum together longer than second, not incrassated 7. *Orthotylus.*
16. (15) Third and fourth joints of rostrum together not longer than second, each slightly thickened towards their juncture 8. *Hypsitylus.*
17. (14) Eyes not nearly touching pronotum 12. *Malacocoris.*
18. (9) Second joint of antennae much longer than third and fourth together
19. (22) Second joint of antennae not much dilated and flattened
20. (21) Insect red 9. *Loxops.*
21. (20) Insect black 11. *Heterocordylus.*
22. (19) Second joint of antennae much dilated and flattened 10. *Heterotoma.*

341. **Pilophorus cinnamopterus** Kb.

Kb. Caps., 72, 81 & 135, 10 (1855); D. & S., B.H. 359 (1865); Saund., H.H.B.I. 264 (1892).

Ova. I have the egg of a *Pilophorus*, which I believe belongs to this species. Its length is about 1 mm. It is narrow, cylindrical, slightly curved, rounded posteriorly, anteriorly with a collar which is semicircularly excised on each side; colour yellowish; rather like *Cyllocoris flavonotatus*, but smaller and not so pale.

Larvae. "Nympha (junior): sanguinea, antennis pedibusque fuscescentibus, vel (adultior) nigro-fusca, subtilissime vix visibiliter flavo-pubescens, antennarum articulo quarto toto margineque postico pronoti et metanoti albis, pronoto trapeziformi, longitudine latiore" (Reuter, 2). The "junior" mentioned above is apparently quite an early instar, and the "adultior" about half grown. In the last instar, 3¾ mm., the abdomen is dark reddish, and the hind margin of pronotum and the metanotum distinctly yellow; last joint of antennae with brown tip; wing-pads rather long, and darker than rest of body; head triangular, with eyes overlapping pronotum, which is rounded at anterior angles to admit of this; the pubescence Reuter speaks of can rarely be seen except on the head; it is probably easily rubbed off.


Nymph of *Pilophorus cinnamopterus* Kb.

Preceding instar similar, but with shorter wing-pads; length 1¾–2 mm.

The yellow border of the pronotum is deeper and more distinct in this species than in the other two, and this feature will help to distinguish it.

Life-cycle. The imago occurs from June to September, but larvae may still be found in August.

Habitat, etc. This species inhabits firs, especially *Pinus sylvestris*, but according to Reuter it is found also on *Abies nigra* and on *A. excelsa*; Douglas and Scott mention its being found also on oaks. The larvae may sometimes be found between the scales of the ripe cones of the first-mentioned tree. The insect is also myrmecophilous, though exactly what the connexion is between it and the ants is not definitely known. It certainly resembles the wood-ant (*Formica rufa*) in both shape, colour, and movements, and I have found it associated with that species which had nests under Scotch firs. Hamm found some young larvae which may have belonged to this species, amongst *Acanthomyops niger*, which were running up and down the trunk of an old and diseased apple-tree. He says, "At this stage the bugs were remarkably ant-like, and there can be little doubt that this mimetic resemblance as well as the companionship of the ants is advantageous to them." Reuter says that its association with ants is only indirect, since both it and its ant-associate are interested in the same Aphides, viz. species of *Lachnus*, though in a different way, for the ants "milk" them, while the bugs suck their juices.

He considers that their mimicry probably protects them from attack by the ants, and this would surely be necessary if, as suggested above, they are to be viewed in the light of cattle-raiders upon the property of their hosts. Nevertheless, it is not correct to say that they live upon an animal diet exclusively, as Reuter saw them sucking the young shoots of the trees. Puton found *P. cinnamopterus* with *Formica congerens*, and remarks on the close resemblance of the two insects both in colour and in gait. Donisthorpe has found this species with *Formica rufa*, and has observed that they sucked the Aphides which were being milked by the ants.

Distribution. This species occurs chiefly in Northern and Central Europe, but also in N. America. In Britain it is not a common species, being recorded from only five English counties, viz. Norfolk, Suffolk, Kent, Surrey, and Hants; the only Welsh record is from Glamorgan, and it has not been found in either Scotland or Ireland.

342. **Pilophorus clavatus** L.

Lin., S.N. 729, 97 (1767); D. & S., B.H. 360 (1865); Saund., H.H.B.I. 264 (1892).

Ova. Unknown.

Larvae. "Nympha: nigro-fusca, subaeneo-opaca, subtiliter, sed distincte fulvo-pubescens, pronoto rectangulari, longitudine paullo latiore, capite parum angustiore, pro- et metanotis margine postico articuloque quarto antennarum dimidio basali albis" (Reuter, 2).

I have three stages of this larva; last instar $2\frac{3}{4}$ mm. Very similar to the preceding species, but deeper in colour, and to be distinguished also by the infuscation of the apical half of the fourth antennal joint; wing-pads rather long, passing base of posterior femora; pubescence distinct; the pro- and metanotal margins and the last antennal joint should be described as yellow rather than "albis" in this instar.

Previous instar, 2 mm. Posterior margin of pronotum concolorous except in the extreme edge; metanotal margin very distinct, bright yellow, more distinct than in the later instar because it is not at all obscured by the wing-pads, which in this instar are only slightly developed; last antennal joint dark at the tip only, and the pubescence very indistinct.

A very early instar, probably the first, about $\frac{3}{4}$ mm., is entirely red, with brown legs and antennae, except the last joint of the latter, which is white with the apical half indistinctly infuscated. In this species the colour is duller, the yellow bands smaller, and the antennae longer and thinner than in the preceding.

Life-cycle. The imago occurs from June to September, and larvae may be found in both June and July.

Habitat, etc. This species occurs on sallows, and according to Reuter also on birch, alder, aspen, hazel, oak, and red currant. J. Sahlberg adds black currant. I have found it very common on the dwarf sallows which grow on hillocks on the sandhills at Kidwelly, Carmarthenshire. It also occurs in mixed hedges. In the New Forest I have found it on *Myrica gale*, and W. West had it from Oxshott on oak. It has also been found on *Pinus sylvestris* (Reuter, 19), although not usually an inhabitant of Coniferae. It is myrmecophilous, and Puton regards it as a mimic of *Formica cinerea* and *F. cunicularia.* According to Reuter, it has been found in company with *Formica fusca, Acanthomyops niger,* and *A. fuliginosus.*

Distribution. It is found throughout the whole of Europe, in Siberia, and in N. America. In Britain it has been taken in eleven English counties, viz. Lancs, Norfolk, Herts, Middlesex, Oxon, Essex, Kent, Surrey, Sussex, Berks, and Hants ; the only Welsh record is from Carmarthenshire, where it is abundant on the dwarf sallows at Kidwelly, and it has been found in Scotland but not in Ireland.

343. **Pilophorus perplexus** D. & S.

D. & S., E.M.M., xii, 101 ; Saund., H.H.B.I. 265 (1892).

Ova. Unknown.

Larvae. Seeing that the chief specific distinctions in the adult lie in the hemielytra, the larvae of all the *Pilophori* are very much alike, and it is not easy to distinguish the species, but I believe the present may be separated by having the second antennal joint still longer and thinner than it is in *P. clavatus.* In other respects it seems to me to be undistinguishable from that species.

The cast skin of the last larval instar is entirely fuscescent, except in the abdomen, which is whitish.

Life-cycle. The imago has been taken from July to October.

Habitat, etc. This species occurs on various trees, and Reuter (12) gives the following list : *Salix, Alnus, Betula, Acer, Tilia, Ulmus, Quercus, Castanea, Prunus avium, Pyrus malus, Amygdalus, Rosa.* Norman records it from oaks in hedges as well as from other parts of the herbage. It is also a myrmecophilous insect. I once found it commonly running up and down the trunk of an oak in Epping Forest in company with *Formica rufa*, a nest of which was situated at the base of the tree, and Norman found it similarly in Scotland. Douglas saw larvae running up the stem of an apple tree amongst a number of *Formica fusca.* Later on adults were seen in a similar situation ; they had also spread to other trees which they had not frequented as larvae. Donisthorpe found it with *Acanthomyops fuliginosus* and *A. niger*, the former at Bexley, Kent, in September, the latter at Chiddingfold in July and at Weybridge in September. The September specimens were dark, while the July one was brightly coloured, almost as bright as *P. cinnamopterus.*

Distribution. It is distributed over Northern and Central Europe, and is found also in Algeria and Tunisia. In Britain it has been recorded from eight English counties, viz. Norfolk, Oxon, Middlesex, Essex, Kent, Surrey, Sussex, and Hants ; it is recorded by Hallett from Glamorgan, but there is no other Welsh record, nor are there any from either Scotland or Ireland. Thus its northernmost limit is Norfolk.

None of the *Pilophori* can be considered common, but where they do occur they are generally in considerable numbers.

344. **Cyllocoris histrionicus** Lin.

Lin., S.N. 728, 89 (1767); D. & S., B.H. 368 (1865); Saund., H.H.B.I., 277 (1892).

Ova. Unknown.

Larvae. "Nympha: virescenti-albida, oculis, antennis, articulo tertii dimidio basali excepto, apice rostri, stria antica femorum, genubus, tarsis punctisque quattuor biseriatis in apice abdominis dorsi positis nigris vel fusco-nigris; pronoto vitta laterali utrinque obscure virescenti; in nympha adulta rudimentis alarum testaceis, apicem versus nigro-virescentibus, dorso abdominis macula basali testacea notato" (Reuter, 2).

It will be seen from the above that there is no trace in the larvae of the brilliant coloration of the adult; all these colours spring into being at the last moult. The larva is one of the most easily recognised, by its whitish colour and its dark antennae, as well as by the early season of its appearance.

Life-cycle. The imago usually begins to appear in the middle of June and continues throughout July; most, however, have disappeared by August, though some few specimens linger on even into September. On the Continent it has been taken even so early as May. Its life in the imaginal form seems to be about as short as that of any *Capsid*.

Habitat, etc. This most handsome and variable species occurs on oaks, on which it is often very abundant; but its numbers vary very much from year to year, and in some seasons it is by no means numerous. It seems to be almost entirely faithful to this one tree. But Douglas and Scott (1) speak of its being very common on *birch* trees, and Carr also mentions birch. J. E. Mason considers that it is mimicked by the beetle *Malthodes sanguinolentus*, which is similarly found on foliage.

Distribution. It is found all over Europe. In Britain it is common and widely distributed, being recorded from twenty-nine English counties, i.e. all except Durham, Staffs, Derby, Salop, Worcester, Rutland, Hunts, Beds, Northants, Hereford, and Monmouth; there are no records from Wales, but it is found in both Scotland and Ireland.

345. **Cyllocoris flavonotatus** Boh. (C. flavoquadrimaculatus, De G., Reut. Osh. Cat.).

Boh. Öfr. V.A. Förh., 71 (1852); D. & S., B.H. 366 (1865); Saund., H.H.B.I. 278 (1892).

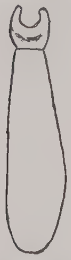
Ova. Length $1\frac{1}{2}$ mm. Tubular, rounded at posterior end, with greatest diameter about $\frac{1}{3}$ of its length from that end; anterior end with a collar which is semi-circularly excavated from side to side; colour very pale yellowish-white, shining, collar opaque; beneath the semi-circular excavation is a deep depression parallel to it.

Larvae. "Nympha: Longitudinaliter sub-rhomboidalis, deplanata, subglabra, dilute virescens, oculis, antennarum articulo primo, pronoto macula antica utrinque, rudimentis alarum basi, margine interiore et apice, nec non femoribus apice dilute fuscescentibus, antennis articulo secundo et tertio apice quartoque toto, rostro summo apice tarsisque nigris; dorso abdominis linea media longitudinali striaque transversa basali pallidioribus, hac medio puncto nigro notata; capite subtriangulari, pronoti margine antico paullo latiore, latitudini aequilongo; pronoto trapeziformi, basi longitudine fere duplo latiore, apice hac circiter $\frac{1}{3}$ latiore; rudimentis alarum dimidium abdominis attingentibus; abdomine a basi apicem versus fortiter acuminato; antennis articulo secundo ultimis conjunctim aequilongo" (Reuter, 2).

Life-cycle. This insect appears as an imago from May to July, and it, too, is an insect with a very short imaginal life.

Habitat, etc. It is found, like the preceding, and usually in company with it, on oaks.

Distribution. It inhabits the whole of Europe. In Britain it is not quite so common as the preceding species; it is recorded from twenty-four English counties, viz. the coast counties from Yorks to Glo'ster, together with Cumberland, Westmorland, Cheshire, Salop, Notts, Cambs, Warwick, Middlesex, Surrey, Berks, and Wilts; it is recorded from Glamorgan in Wales, and from both Scotland and Ireland.


Egg of *Cyllocoris flavonotatus* Boh.

346. **Aëtorhinus angulatus** Fall. (Blepharidopterus id. Osh. Cat.).

Fall. Hem. Suec., i, 80, 8 (1829); D. & S., B.H. 347 (1865); Saund., H.H.B.I. 279 (1892).

Ova. Unknown.

Larvae. "Nympha: virescens, pilis fuscis erectis parce pilosa, antennis tibiisque pallescentibus, oculis, puncto basali tibiarum apiceque tarsorum nigris; rudimentis alarum basi saturatius viridibus, pronoto postice pallescente; basi abdominis dorsi macula parva media ferruginea." (Reuter, 2.)

This larva can easily be recognised by its narrow green body, and especially by the deep black dot at the base of the tibiae, which is equally distinct in all instars.

Life-cycle. The imago occurs from June to October.

Habitat, etc. This is another arboreal species, but it is not, like the two preceding, confined to a single kind of tree; it occurs on *Alnus*, *Betula*, and *Salix* most commonly, but Carr adds *Corylus*, *Fraxinus*, *Quercus*, and *Ulmus*, and Reuter (12) gives in addition *Pyrus* and *Lonicera*. J. E. Mason adds sloe and maple. Morley (4) says it is sometimes attracted to electric light at night.

Distribution. It is found all over Europe up to 62° N. lat., and also in

Algeria, Turkestan, and Siberia. In Britain it is one of our commonest insects, and is widely distributed, being recorded from thirty-three English counties, the only exceptions being Salop, Worcester, Northants, Rutland, Hunts, Beds, and Dorset; the Welsh records are from the counties of Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

347. **Globiceps cruciatus** Reut.

Reut. Öfr. V.A. Förh., xxi, 36 (1879); D. & S., B.H. 364 (1865) (flavomaculatus); Saund., H.H.B.I. 281 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from July to September.

Habitat, etc. This species is found on sallows, including the dwarf species which grows on sandhills, among the stems and roots of which I have found it at Kidwelly, Carmarthenshire. But I have met with it also at the roots of other plants on wayside banks.

Reuter (12) describes the following variety of the ♀:

"Hemielytris sordide albido-flaventibus, corio versus apicem dilute sordide ochraceis, ipsa basi corii, clavo toto maculaque corii communi rotundata circa commissuram nigris. ♀."

This insect is pterygo-dimorphic, the ♂ being always macropterous and the ♀ generally brachypterous, with abbreviated cuneus, and membrane consisting only of a fringe on its inner side.

The ♂ may be distinguished from that of the following species by the difference in the shape of the forcipes, which are thus described by Reuter (12):

"Forceps maris dextra irregulariter sub-cordata, lobo dextro breviore et latiore, sinistro longiore et lateribus sub-parallelo, margine supero forcipis medio angulariter emarginato in lobulo utroque praecipueque in dextro aciculis pluribus armato; forceps sinistra basi externe latius angulariter ampliata, valde hamato-curvata, supra curvaturam spina nonnihil recurvata armata."

Distribution. It inhabits the greater part of Europe, and in addition Turkestan and Siberia. In Britain it is recorded from only twelve English counties, viz. Northumberland, Durham, Yorks, Lancs, Cheshire, Derby, Notts, Lincs, Kent, Surrey, Sussex, and Devon; the only Welsh record is my capture referred to above on the Carmarthenshire sandhills; it is found in both Scotland and Ireland.

348. **Globiceps flavomaculatus** Fabr.

Fab., S.R. 247, 30 (1803); D. & S., B.H. 363 (1865) (selectus); Saund., H.H.B.I. 280 (1892).

Ova. Unknown.

Larvae. "Nympha: Oblonga, sat deplanata, glabra, capite, dorso thoracis rudimentisque alarum fuscescentibus, pronoto margine basali sordide albicanti; abdomine sordide et obscure virescenti, antennis basi pedibusque rufo-testaceis; capite pronoto multo latiore, fronte convexa; pronoto brevi; rudimentis alarum maris longis, fere dimidium dorsi abdominis attingentibus; antennis articulo secundo maris apicem versus levius incrassato et tertio duplo longiore" (Reuter, 2).

Life-cycle. The imago occurs from May to August.

Habitat, etc. Douglas and Scott (1) record it from *Umbelliferae* and by searching amongst grass at roots of broom and other bushes, Parfitt from nut bushes, and Reuter (12) from *Urtica*. I have found it also at the roots of plants and amongst decaying branches of willow which had lain long on the ground and been overgrown by long grass.

Reuter (12) describes a var. of the ♂ thus:

"Vertice carina utrinque oculum sub-attingente lateribus distincte curvata, ante hanc longitudinaliter plicato; forcipe dextra margine infero obliqua ibique apice aciculis duobus basi connexis instructa."

The forcipes of the normal ♂ are thus described by Reuter (12):

"Forceps maris dextra, tantum sinistrorsum sub angulo magis minusve producto et depresso longe prolongata, hac prolongatione marginibus subparallelis, margine supero apicem versus aciculis brevibus instructo, infero apice aciculis binis vel singulo; forceps sinistra falciformis margine externo ad curvaturam ramum rectum minus longum apice aciculatum emittens."

This insect also is pterygo-dimorphous, the ♂ being always macropterous and the ♀ almost always brachypterous; the macropterous ♀ is very rare and has not, I believe, been taken in this country.

Distribution. It is found chiefly in Northern and Central Europe, apparently not reaching the Mediterranean coast, but passing into Siberia. In Britain it is rather more widely distributed than the preceding species, being recorded from sixteen English counties, viz. Durham, Yorks, Lancs, Cheshire, Leicester, Norfolk, Suffolk, Cambs, Essex, Kent, Surrey, Sussex, Wilts, Dorset, Devon, and Somerset; there are Welsh records from Carnarvon and Glamorgan, and it is reported from Ireland, but not from Scotland.

349. **Globiceps dispar** Boh.

Boh. Öfr. V.A. Förh., 72 (1852); Saund., H.H.B.I. 281 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to August.

Habitat, etc. As the habitat for this species, Reuter gives meadows and woods, especially in shady places. I have found it also at the roots of low vegetation on the face of a cliff by the seaside at Gimingham, Norfolk. Like the rest of the genus, the species is pterygo-dimorphous, the ♂ being always macropterous and the ♀ usually brachypterous; macroptery in this sex is rare. On the sands at Corton, near Lowestoft, I found in August, 1891, a single macropterous ♀ running about on the wet sand at the margin of the sea and just out of reach of the waves. No other specimens of either sex could be discovered after a long search in that neighbourhood, but at Fritton, about 5 miles inland, I came across the species plentifully in a marshy field covered with tall grass and rushes. They occurred quite concealed at the roots of the great masses of vegetation, which had to be turned aside to reveal them. The ♀♀ were all brachypterous, and were far more numerous than the ♂♂. The latter, like the same sex in *Cyrtorrhinus caricis*, were very agile and readily took wing. The macropterous ♀, being gifted with the power of flight, had evidently wandered from its original home, which, however, may have been at some nearer spot than Fritton. This migration of a species would seem to be one of the chief functions of these occasional macropterous examples. The macropterous form of the ♀, which was unknown to Reuter when he wrote his "Hemiptera Gymnocerata Europae," is described by Douglas and Scott in "Ent. Mo. Mag.," iv, 48.

Distribution. This does not seem to be a widely distributed species. Apart from the British Isles, it is recorded from Northern and Central Europe and from Turkestan, reaching a northern limit of 63° 40′ N. lat. In Britain even it is by no means of general occurrence, being recorded from only seven English counties, viz. Northumberland, Lancs, Cheshire, Glo'ster, Norfolk, Suffolk, and Surrey; there are Welsh records from the counties of Carnarvon and Glamorgan; and it is found in both Scotland and Ireland.

(*Globiceps ater* D. & S. is based upon one ♀ specimen taken by Marshall at Leicester. No other specimens have occurred either in Britain or elsewhere, and consequently nothing more is known of the species. From the description it would appear to be a dark var. of *G. dispar*. In fact, at the time of its capture Fieber, to whom it was referred, thought it might be the ♀ of *G. dispar*, but he did not know that insect at the time.)

350. **Mecomma ambulans** Fall.

Fall. Hem. Suec., i, 126, 20 (1829); D. & S., B.H., 349 (1865); Saund., H.H.B.I. 282 (1892).

Ova. Length 1 mm. Colour yellowish; tubular, short, rather broad, and strongly curved throughout, rounded posteriorly, obliquely truncate anteriorly; collar about as broad as the body of the egg.

Larvae. The following is Reuter's (2) description: "Nympha: statura formae brachypterae ♀ sat similis; rufo-ferruginea, glabra, capite, pronoto rudimentisque alarum brunnescentibus, antennarum articulis duobus ultimis pedibusque pallide flavis, tarsis basi apiceque brunneis." It is not strictly correct to describe the insect as glabrous, for in the last two instars at least the dorsal surface is furnished with a scattered pale pilosity, which is rather longer on the fore parts than on the abdomen. Moreover the description applies to the larva of the ♀ in the last instar; that of the ♂ is more elongate, and has not the broad ovate abdomen which the ♀ has, but is more narrowly elliptical; the wing-pads are very short in the ♀, and in the ♂ of the usual length, extending at least half-way down the body. In this instar the antennae of the ♂ have the second joint thickened and cylindrical, that of the ♀ slightly clavate. Length of ♂ larva 3 mm., of ♀ $2\frac{1}{3}$ mm.

In a younger instar, of barely 2 mm., the colour is greenish-yellow, rufescent in parts, especially at the base of the abdomen, and the dark mass of the digestive organs appears through the delicate skin of the abdomen. In the successive instars the first three antennal joints gradually lengthen, but the fourth remains of about the same actual length throughout, so that it comes ultimately to bear a far smaller proportion to the others than at first. In both instars, again, the pronotum is much more transverse than in the adult. Dried specimens are more deeply rufescent than when fresh, and the delicate green of certain parts entirely disappears.

Life-cycle. The larvae mature for the most part by the end of June, and adults have been found from June to September. I have searched in February beneath grasses where the insect is most abundant in the summer, but have been unable to find a single example. It may be concluded, therefore, that the insect passes the winter in the egg condition and not as an adult. The eggs are hatched probably near the beginning of May, although some specimens certainly do not see the light till later.

Habitat, etc. This species occurs in damp places, amongst rushes and long grasses. Carr mentions finding it on broom, and Reuter (12) gives *Aspidium filix-femina* and *Polypodium dryopteris*. I also have found it amongst ferns in S. Wales. The larvae live at the roots of the plants. There is in this insect a most striking ptergyo-dimorphism. The ♂ is always macropterous, with hemielytra much longer than the body, and the ♀ almost always brachypterous, with the black hemielytra reduced almost to scales without any membrane, and in which neither clavus nor cuneus can be distinctly traced. Very occasionally the macropterous ♀ is found, a totally different looking insect from the brachypterous, resembling the ♂ in shape, though a little shorter, and with clavus and corium black, and cuneus and membrane fuliginous. There is a specimen of this in the Power Collection, taken at Balmuto, Fifeshire; Mr. R. M. Leake reports taking another on June 15th, 1893, by sweeping long grassy herbage at Headley Lane, Surrey; I took a third by searching at roots of rushes in Epping Forest on July 21st, 1909; Mr. G. E. Hutchinson a fourth at Culgaith, Cumberland, on August 19th, 1920; and Mr. H. R. P. Collett a fifth at Ashley, Cheshire, on August 6th, 1922. Beyond these I know of no British specimens.

Distribution. This species occurs more or less throughout Europe, but it is found also in Siberia, Algeria, and N. America. In Britain it is very generally distributed, being recorded from thirty English counties, i.e. from all except Westmorland, Staffs, Salop, Worcester, Northants, Rutland, Hunts, Beds, Middlesex, and Monmouth; the Welsh records are from the counties of Carnarvon, Brecknock, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

351. **Cyrtorrhinus caricis** Fall.

Fall. Hem. Suec., i, 123, 15 (1829); D. & S., B.H. 352 (1865); Saund., H.H.B.I. 283 (1892).

Ova. Unknown.

Larvae. "Nympha: ovalis, obscure prasina (pistazina), colore antice in testaceum nonnihil vergente, subglabra, oculis, apice rostri tarsorumque fuscis; abdomine viridi, gutta basali pulchre ochracea; rudimentis alarum longis, elongatis, apicem segmenti tertii dorsalis attingentibus" (Reuter, 2).

To this it may be added that all the instars have the same coloration and differ simply in the usual development of the wing-pads, and the increasing proportionate length of the second antennal joint.

The last instar measures 2½ mm., the penultimate 2 mm., and the one preceding that, which shows no wing-pads, 1½ mm. The pronotum in all is very transverse.

1st instar, ¾ mm. Body orange, eyes red, legs dusky ochraceous, claws black. The contents of intestine show black through the skin. Terminal joint of antennae rather stout and long.

Life-cycle. Most of the larvae mature by the end of June, but some remain for another month; the imago occurs from June to September, and on the Continent in May, and the life-cycle is apparently pretty much the same as that of the preceding species. I have taken the first instar on June 1st, but this was in the rather late season of 1922.

Habitat, etc. This species lives amongst rushes, and also, according to Reuter (12), amongst *Carices* and *Eleocharis*. J. Sahlberg gives *Carex vesicaria*. The ♀ occurs chiefly near the roots of the plants, where it runs up and down the stems; the ♂ occurs higher up, and is a much more active insect, frequently taking flight. The ♀ is almost always brachypterous, having the membrane abbreviated. The ♂ is always macropterous.

Mr. F. Muir tells me that an Australian species allied to this performs the useful rôle of piercing and sucking the contents of the eggs of *Delphacidae* which are parasitic upon sugar cane, and suggests that our British species may similarly be an ovivorous insect.

Distribution. It inhabits Northern and Central Europe, together with Turkestan and Siberia. In Britain it is widely distributed, being recorded from twenty-eight English counties as follows: the coast counties from

Northumberland to Cornwall, except Lincs, and from Cumberland, Lancs, Cheshire, Notts, Leicester, Warwick, Worcester, Hereford, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from the counties of Carnarvon, Carmarthen, and Glamorgan, and it occurs in both Scotland and Ireland.

352. **Cyrtorrhinus pygmaeus** Zett.

Zett. Ins. Lap., 279 (1839); Saund., H.H.B.I. 285 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found in August and September.

Habitat, etc. This insect inhabits clumps of rushes in marshy places. It lives where there are dense tufts of the food-plant, which have been long established, so that there are plenty of dead stems and broken pieces making a tangle under which there are bare patches of earth between the growing stems. These dead pieces usually bear minute fungoid growths, and it is possible that these, rather than the rushes themselves, may be the centre of attraction. The bugs run rapidly up and down the dead and yellow stems, with the colour of which they perfectly harmonise, but they do not fly. I have scarcely ever been able to capture them in any other way than by searching in the centre of these masses of rushes. J. Sahlberg gives "Carices."

A variety is thus described by Reuter (12): "Pallide flavescens, capite cum antennis nigro, apice articuli primi antennarum maculaque verticis utrinque flavis, pronoti limbo postico, scutello lateribusque ventris leviter fuscescentibus. ♀."

Most of our British specimens seem to belong to this paler but black-headed form, as Reuter (12) describes the type thus: "Niger, nitidus, pallido-sericans, antennis articulo primo apice, puncto verticis utrinque, pronoto macula apicali sub-triangulari, ventre medio, pedibus hemielytrisque sordide flavo-albidis, membrana hyalina, venis pallidis; femoribus saepe aurantiacis." Of my own specimens only a very few agree with this description, and the majority are as described in the var.

Distribution. This is by no means a common species; it is recorded only from Northern and Central Europe. In Britain it has occurred in thirteen English counties, viz. Northumberland, Norfolk, Suffolk, Glo'ster, Herts, Middlesex, Kent, Surrey, Sussex, Berks, Hants, Dorset, and Devon; in Wales it is reported from Pembrokeshire, but it has not been found in either Scotland or Ireland.

353. **Cyrtorrhinus geminus** Flor.

Flor. Rhyn. Liv., 606, 54 (1860); E.M.M., xlvi, 29.

This species may be distinguished from the preceding as follows: The basal joint of the antennae is considerably longer than in *C. pygmaeus*, and instead of being black with pale apex, as is always the case in *C. pygmaeus*, it is either wholly pale, or with at most a slight dark shade at the *apex*; the legs of *C. geminus* are much longer, and the spines on the hind tibiae larger and darker. The insect as a whole also is slightly larger. The size and colour of the basal antennal joint will, however, always enable it to be recognised. It is also pterygo-dimorphous, which is not known to be the case with *C. pygmaeus*. The brachypterous form has the hemielytra shorter than the abdomen, or sometimes about equal to it, while in the macropterous they are about half as long again as the abdomen; the membrane in the former is small and in the latter large. Both forms are found with us.

Reuter (12) thus describes a variety: "Pallidior, antennis etiam articulo secundo testaceo, ultimis fuscescentibus."

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in September and October.

Habitat, etc. This species also is found in marshy places, and might very easily be passed over as the preceding; J. Sahlberg gives the food-plant as *Carex vesicaria*. It is a dimorphous species, but the macropterous form is very rare.

Distribution. This is a very little known species. Outside of Britain it is recorded only from Finland, Livonia, Northern and Central Russia, and Siberia. In Britain, only a few specimens have been taken. I have two, one taken at Broxbourne, Herts, on September 18th, 1909, and the other probably in Surrey some years earlier; the only others that I know of have occurred to Mr. J. Edwards near Delamere Forest, Cheshire.

354. **Cyrtorrhinus flaveolus** Reut.

Reut. Not. S.F.F. Fenn. Förh., xi, 323 (1870); Saund., H.H.B.I. 284 (1892).

Ova. Unknown.

Larvae. "Nympha: Imagini statura simillima, pallide straminea, abdomine lateribus maculaque dorsi basali aliaque plerumque media disci aurantiacis; rudimentis alarum apicem segmenti primi abdominis attingente" (Reuter, 2).

Life-cycle. The imago occurs from July to September.

Habitat, etc. This species again inhabits rushes in marshy places, both inland and in salt marshes. J. Sahlberg gives *Carex vesicaria*. In a large damp field near Fritton Decoy, Suffolk, where there were very thick and long-established growths of rushes, I found a single macropterous ♂ under the rushes, in company with *Nabis lineatus*, *Globiceps dispar*, and *Cyrtorrhinus pygmaeus*; and I have taken the brachypterous form of both sexes at Whitstable amongst *Juncus compressus*, in company with *Teratocoris saundersi*. The brachypterous form, which is much the commoner, has the hemielytra rounded and showing no trace of the cuneus, though the claval suture is very distinct; the membrane is represented only by a mere margin on the inner edge, of about the same texture as the corium.

Distribution. This again is a very little known species. Outside of Britain it is reported only from Finland and Sweden. In Britain it has been obtained in four counties only, Norfolk, Suffolk, Kent, and Dorset, in all of which I have taken it.

The following genus *Orthotylus* contains many green species, which are sometimes confused by beginners with species of *Lygus*; the latter, however, have a collar to the pronotum, which is absent from *Orthotylus*; *Orthotylus*, again, consists of insects that are usually narrower than *Lygus*.

355. **Orthotylus fuscescens** Kb.

Kbm. Caps., 237 & 239 (1855); Saund., H.H.B.I. 286 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to August.

Habitat, etc. It inhabits the Scotch fir (*Pinus sylvestris*). With this species we begin a genus containing many closely allied species, the majority of which are coloured with some shade of green. They are noteworthy for the extraordinary shapes assumed by the forcipes in the ♂, and these should be carefully studied, as they usually form important aids to identification, especially in the case of species which are much alike in general appearance. The extraordinary shape of these instruments in the present species should be noted. The nature of the pubescence is also an important feature in most of the *Orthotyli*, and should be carefully noted. This is not always easy, as it readily becomes abraded.

Distribution. Very little is known of this insect. It inhabits Europe generally. So far as the British Isles are concerned it has been found hitherto only in Scotland, where it was discovered at Forres by Norman in 1877; he discovered it "in profusion on pines in the Cluny Hill grounds, but very locally," as he says he took it "on some dozen isolated trees, but nowhere else in the whole neighbourhood."

356. **Orthotylus bilineatus** Fall.

Fall. Mon. Cim., 102, 13 (1807); Saund., H.H.B.I., 286 (1892).

Ova. Unknown.

Larvae. Last instar, 3–3¼ mm. Greenish ochreous; head with a diamond-shaped fuscous spot in front; pronotum transverse, more or less infuscated at sides; wing-pads with a broad irregular fuscous stripe inwardly; abdomen with an orange spot at base; femora green, tibiae yellowish, tarsi fuscous; antennae fuscous, each joint narrower than the preceding; rostrum pale, black at apex, reaching to intermediate coxae; terminal segment of abdomen infuscated; dorsal surface with a scattered flavous pilosity.

Life-cycle. The imago occurs from the end of July to September.

Habitat, etc. It inhabits aspen (*Populus tremula*), on which tree it is often very abundant. It has been found also on white poplar (Morley, 4), and by Norman on *Sorbus aucuparia.* Reuter (12) gives in addition *Populus balsamifera*, and *Pyrus malus*. In Scotland, at Achilty, Buchanan White (1) found the ♂ much rarer than the ♀, in the proportion of about 1 in 10.

Distribution. It is generally distributed in Europe and occurs also in Algeria. In Britain, it has been recorded from fourteen English counties, viz. the coast counties from Lincs to Sussex, together with Notts, Leicester, Hereford, Glo'ster, Bucks, Herts, Surrey, and Dorset. There are no records from Wales or Ireland, but it occurs in Scotland up to a height of 1500 feet.

356a. **Orthotylus virens** Fall.

Fall. Hem. Suec., 122, 13 (1807); E.M.M., liii, 251.

The sexes of *O. virens* are unlike; the ♂ is elongate, parallel-sided, dull green above, with long, scattered pale pubescence and black beneath, sometimes variegated with yellowish or greenish; head inclining to fuscous, sometimes black, but with yellowish margins to the eyes; vertex carinated; pronotum trapezoidal with sides sinuate, transversely striated behind the callosities; callosities and base of scutellum more or less fuscous (this colour sometimes extends over the whole of both pronotum and scutellum); extreme base of corium and apex of cuneus yellow; membrane blackish, with cell-nerves partly luteous, and a hyaline spot in smaller cell and at apex of cuneus; rostrum yellowish, with apex black; antennae black, nearly as long as body; legs yellowish-green, with apex and extreme base of tibiae fuscous; tarsi black; genital segment very large, right forceps with a strong spine on outer margin.

The ♀ is much like that sex in *O. flavinervis*, but smaller and narrower, and with pubescence longer and more scattered, not parallel-sided as in ♂, but slightly rounded, light green above and beneath, the abdomen only being slightly infuscated; head and callosities of pronotum yellowish, especially after death; membrane not so dark as in ♂, and with yellowish nervures to the cells; pubescence, rostrum, and legs as in ♂; antennae greenish testaceous, last two joints black.

Length, a little under 5 mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in July.

Habitat, etc. It inhabits sallows, and especially *S. pentandra*, on which it was taken in some numbers by Mr. G. B. Routledge; Day reports it from sallows and the herbage beneath them, and Murray took one specimen on alder. Our British specimens appear to be rather smaller than usual, as

Reuter (12) gives 5¼–5½ mm. as the length of the ♂, and 5 mm. for the ♀. Reuter (12) describes three varieties of the ♂ thus :

> (*a*) Capite, pronoto scutelloque fusconigris, solum angulis posticis pronoti obscure virentibus.
>
> (*b*) Capite, orbitis lutescentibus exceptis, callis pronoti basique scutelli nigris.
>
> (*c*) Superne virescens, capite, apice pronoti, basique scutelli flavis, capite ad clypeum utrinque fusco ; antennis nigro-fuscis, articulo primo versus apicem pallescente ; inferne flavescens, pedibus, flavo-virentibus.

Distribution. *O. virens* inhabits Northern and Central Europe, and Siberia. In Britain it has thus far occurred only in Cumberland and Westmorland ; Mr. Day reports that Cumwhitton Moss, where he and Mr. Routledge found it is a typical Cumberland peat-moss ; Mr. Murray's specimen was taken some 12 or 13 miles away from this, at Spa Well, on the River Eden. Mr. Hutchinson (3) reports it from Woodside Moss, Cliburn, Westmorland, as well as from Newton Reigny Moss, Cumberland.

357. **Orthotylus flavinervis** Kb.

Kbm. Caps., 78, 99, & 147, 16 (1855) ; D. & S., B.H. 338 (1865) ; Saund., H.H.B.I. 289 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in July and August.

Habitat, etc. It inhabits alders, *Alnus glutinosa* and *A. incana*, and Reuter (12) adds also *Salix*. When living it can scarcely be confounded with *O. marginalis*, as the contrast of the yellow head and other yellow parts is very striking ; when dried it is much more difficult to distinguish, as the green fades to a yellowish colour, but the yellow cell-nerves should then settle the matter, while the peculiar shape of the right forceps of the ♂ gives further confirmation.

Distribution. This species is recorded from Northern and Central Europe. In Britain it is reported from fourteen English counties, viz, the coast counties from Norfolk to Glo'ster, except Essex, together with Hereford, Oxon, Bucks, and Surrey. There are no Welsh or Irish records, but it has been found in Scotland.

358. **Orthotylus marginalis** Reut.

Reut., H.G.E., iii, 350 & 550 (1884) ; D. & S., B.H. 337 (1865) (nassatus) ; Saund., H.H.B.I. 290 (1892).

Ova. Length 1 mm. Yellowish, tubular, bent about half-way along its length, much constricted below anterior end, which forms an outward-bending lip all round ; surface smooth and shiny.

Larvae. "Nympha: virescens, subtilissime pallido-pubescens (fere glabra) capite pronotoque pallidioribus, antennis, apice tibiarum tarsisque pallidis, his apice nigris; rostro apice nigro; dorso abdominis puncto basali pulchre ochraceo" (Reuter, 2).

To this may be added as follows: Last instar, 4 mm. A few rather strong black hairs round the marginis of head and pronotum; the latter transverse and slightly emarginate in front; lateral margins of wing-pads with a fringe of hairs; first three joints of antennae with fine, rather long, blackish hairs, basal joint inwardly with a few stronger ones; posterior tibiae hairy; rostrum reaching beyond intermediate coxae.

Life-cycle. The imago is to be found from June to October. Most of the larvae appear to mature by the end of June.

Habitat, etc. This species occurs commonly on various species of *Salix*, including *S. repens*, and also on *Alnus*. Morley (4) records it from oak and Saunders (33) from elm, and Reuter (12) adds *Pyrus malus*. This is another species which is in some parts of England becoming a pest in apple orchards. The young larvae, like those of *Plesiocoris rugicollis*, pierce the young buds, both flower and fruit, and cause their malformation, thus seriously affecting the fruit crop. Mr. G. B. Routledge has sent it me from black currant on which it may do similar damage. The basal joint of the antennae in this species is subject to a good deal of variation. Saunders describes it as pale in both sexes, but this is not correct; it is often dark, sometimes almost entirely black, in the ♂, and even in the ♀ there is often a dark shade at the base, especially on the underside. I have seen a specimen taken by Mr. H. Fortescue Fryer, which has both basal joints outwardly tumid at the apex, as if they contained an internal parasite.

The curious form of the ♂ claspers should be noted.

Distribution. According to Oshanin's List, this species is of European distribution, and extends also into Siberia. In Britain it is one of the commonest species of the genus. It is recorded from twenty-nine English counties, viz. all the coast counties from Northumberland to Glo'ster together with Cumberland, Westmorland, Cheshire, Derby, Notts, Leicester Cambs, Warwick, Worcester, Hereford, Oxon, Bucks, Surrey, Wilts, and doubtful records for Devon and Cornwall; the Welsh records are from four counties, Carnarvon, Brecknock, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

359. **Orthotylus tenellus** Fall.

Fall. Mon. Cim., 90, 67 (1807); D. & S., B.H. 343 (1865) (angustus); Saund., H.H.B.I. 289 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to August.

Habitat, etc. This species inhabits several trees: oak, ash, hazel, *Pyrus*, but I believe its preference is for oak, from which it may be obtained by beating. The ♂ claspers are not very large nor remarkable in shape, but the curious cream-like colour, with a tinge of green, and the large and intensely black eyes, forming a great contrast to the rest of the insect, usually enable it to be recognised in the net. A lens shows the extreme shortness of the terminal joint of the antennae, and so confirms the identification.

Distribution. This insect appears to be spread over the greater part of Europe. In Britain it is recorded from seventeen English counties, viz. Cumberland, Notts, Lincs, Norfolk, Suffolk, Hereford, Glo'ster, Bucks, Herts, Middlesex, Essex, Surrey, Hants, Dorset, Somerset, Devon, and Cornwall; the only Welsh records are from Carmarthen and Glamorgan, but it is found in both Scotland and Ireland. It is probably often overlooked, and does not appear to be ever very abundant.

360. **Orthotylus nassatus** Fabr.

Fab. Mantiss., ii, 304, 251 (1787); D. & S., B.H. 336 (1865) (striicornis); Saund. H.H.B.I. 287 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from July to September.

Habitat, etc. It is found on oaks (Saunders), ash (J. E. Mason), willows (Carr), and Reuter (12) adds *Tilia parvifolia*, *Salix purpurea*, and *S. lambertiana*. It is not easy to distinguish in the net; of course the dark underside of the basal antennal joint is the point to be aimed at; the claspers of the ♂ are large and very curious.

Distribution. This insect is generally distributed in Europe, and extends to Algeria. In Britain it is recorded from twenty-one English counties, viz. the coast counties from Lincs to Cornwall, except Suffolk and Hants, together with Durham, Cheshire, Notts, Cambs, Warwick, Hereford, Glo'ster, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts; the only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland.

361. **Orthotylus viridinervis** Kb.

Kb. Caps., 78, 95, & 142, 13 (1855); Saund., H.H.B.I. 287 (1892).

Ova. Unknown.

Larvae. The larvae of this and the following three species are fusiform and light green, but I have not yet been able to find characters by which they can be distinguished from one another.

Life-cycle. The imago has been found in July and August.

Habitat, etc. It inhabits *Ulmus montana*, but has been found also on oak (Reuter) and hazel (J. Edwards). This is the first of a series of four species which, in the net, are practically indistinguishable. Under the lens, the most easily recognisable point of distinction is the length of the hairs, which give this insect a rough and untidy appearance ; the ♂ claspers also are quite characteristic, but to see them properly the wings should be spread. The long hairs under the anterior femora also should be noticed, a feature which this species possesses in common with *O. diaphanus*.

Distribution. It is found in Europe generally. In Britain the records are but few ; there are only eleven English counties, viz. Cumberland, Cheshire, Derby, Notts, Norfolk, Suffolk, Glo'ster, Bucks, Kent, Surrey, and Dorset ; the only Welsh record is from Glamorgan ; it is found in Scotland, where, indeed, it was discovered by Prof. Reuter himself. Probably it has been overlooked in other parts.

362. **Orthotylus prasinus** Fall.

Fall. Hem. Suec. Cim., 81 (1829) ; Saund., H.H.B.I. 288 (1892).

Ova. Unknown.

Larvae. Fusiform and light green.

Life-cycle. The imago occurs from June to August.

Habitat, etc. It is found on *Ulmus campestris* and on *Corylus avellana*, and J. Edwards adds lime, wych-elm, and maple. Saunders records it from ash. The ♂ forcipes are quite distinctive, but to see them properly the wings should be spread. Of course the shorter hairs and the absence of the hairs under the anterior femora distinguish it at once from *O. viridinervis*, but these are of no avail to separate it from the two following species.

Distribution. It is found throughout Europe and in Algeria. In Britain it has been recorded from only eight English counties, viz. Yorks, Lincs, Norfolk, Suffolk, Essex, Sussex, Wilts, and Glo'ster, and from Ireland ; in Wales Hallett has a doubtful record from Glamorgan, but it is not recorded from Scotland. No doubt it has been overlooked in consequence of its resemblance to other species.

363. **Orthotylus scotti** Reut.

Reut., E.M.M., xiv, 62 ; D. & S., B.H. 335 (1865) (viridinervis) ; Saund., H.H.B.I. 288 (1892).

Ova. Unknown.

Larvae. Fusiform and light green.

Life-cycle. The imago has been found in June, August, and September.

Habitat, etc. It inhabits elm, and I have found it also on nettles. Douglas and Scott (1) found it on plum trees and J. Edwards on wych-elm. The forcipes of the ♂ are sufficiently different from those of the allied species to enable it to be recognised, but to see them properly the wings should be spread.

Distribution. On the Continent it has been recognised only in the central parts. In Britain it is recorded from eleven English counties, viz. Lincs, Norfolk, Suffolk, Cambs, Glo'ster, Herts, Middlesex, Kent, Surrey, Sussex, and Berks; the only Welsh record is from Carmarthen, and it is found in Ireland, but has not been reported from Scotland.

364. **Orthotylus ochrotrichus** Fieb.

Fieb. Wien. Ent. Mon. (1864); D. & S., B.H. 342 (1865); Saund., H.H.B.I. 288 (1892).

Ova. Unknown.

Larvae. Fusiform and light green.

Life-cycle. The imago has been found from July to September.

Habitat, etc. This species seems to be with us the commonest of this group of four, and it occurs on a great variety of food-plants, such as elm, oak, and many hedgerow shrubs and plants. J. Edwards has it from lime, and Douglas and Scott (1) took their first specimen by sweeping *Ononis*, but this was probably merely a casual occurrence. The ♂ claspers are quite characteristic, but to see them properly the wings should be spread.

Distribution. This species does not seem to have been recognised outside the British Isles except in Spain. In Britain it has occurred in fourteen English counties, viz. Yorks, Notts, Leicester, Suffolk, Hereford, Glo'ster, Oxon, Herts, Kent, Surrey, Sussex, Berks, Hants, and Somerset; the Welsh records are from Carmarthen and Glamorgan, and it is recorded from Ireland, but not from Scotland.

365. **Orthotylus diaphanus** Kb.

Kbm. Caps., 238 & 305 (1855); Saund., H.H.B.I. 287 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from July to September.

Habitat, etc. This insect occurs on various species of *Salix*, and also on ash. The ♂ forcipes are small and insignificant, though quite characteristic when their outline can be determined. Its pale colour gives it almost always an aspect of immaturity. This and its smaller size, as well as the long hairs beneath the anterior femora, enable it to be easily recognised.

Distribution. It is found in the greater part of Northern and Central Europe and in Siberia. In Britain it has occurred in twenty English counties, viz. the coast counties from Yorks to Dorset, except Hants, together with Cheshire, Notts, Leicester, Cambs, Hereford, Glo'ster, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the only Welsh record is from Carmarthen, and it is not recorded from either Scotland or Ireland.

366. **Orthotylus flavosparsus** Sahlb.

Sahlb. Geoc. Fen., 103, 26 (1848); D. & S., B.H. 344 (1865) (prasinus); Saund., H.H.B.I. 291 (1892).

Ova. Unknown.

Larvae. "Nympha: virescens, rudimentis alarum obscurioribus, nebulis dilutioribus signatis, dorso abdominis puncto basali ferrugineo, tibiis tarsisque lutescentibus, his apice nigris" (Reuter, 2).

To this may be added that the dorsal surface is furnished with a rather scattered pubescence of fine black hairs, each springing from a minute black point, and that the pronotum is very transverse, and the basal antennal joint rather stout. Wing-pads of moderate length. Last instar $2\frac{3}{4}$ mm.

Life-cycle. The imago is found from June to September, but larvae may still be met with in August.

Habitat, etc. This is an inhabitant of low plants only, and lives on various species of *Chenopodiaceae*, and is often abundant on such plants on the sea-coast. Morley (4) records it from *Artemisia maritima*, and Whittaker (1) mentions *Chenopodium album*. I have found it in gardens on beet, and Parfitt speaks of seeing it on potato plants. The patches of silvery pubescence which are very characteristic when the insect is fresh, easily become abraded, and scarcely appear at all in worn specimens. The most reliable characteristic is the green colour of the area included in the cells of the membrane. Bueno (4) records that he has taken it at light. Reuter (12) mentions two varieties as follows :

(*a*) Capite, pronoto antice scutelloque basi vel toto virescenti-flavis, vel flavescentibus.

(*b*) Hemielytris maculis flavis omnibus fere evanescentibus.

Distribution. According to Oshanin, this species occurs throughout the Palaearctic, Nearctic, and Neotropical Regions. An American specimen which I have seen indicates a much smaller insect than ours. In Britain it has been recorded from sixteen English counties, viz. the coast counties from Norfolk to Somerset, except Dorset, together with Cumberland, Durham, Cheshire, Cambs, Middlesex, Surrey, and Berks ; in Wales it is reported from Carnarvon and Glamorgan, but it has not occurred in either Scotland or Ireland.

367. **Orthotylus chloropterus** Kb. (O. virescens D. & S., Reuter & Osh. Cat.).

Kb. Caps., 89, 121, & 156, 21 (1855) ; D. & S., B.H. 339 (1865) (virescens) ; Saund., H.H.B.I., 290 (1892).

Ova. Unknown.

Larvae. I have larvae which probably belong to this species, but the difficulty is that two or three of these small green species sometimes inhabit the same broom plants at the same time, so that it is not easy to assign to each its proper larva. The specimens referred to were green throughout and have become a kind of olive-grey ; whole body covered with a vestiture of stout black hairs ; wing-pads long and rather broad ; antennae stout ; tarsi two-jointed, basal joint small ; claws large, black.

Life-cycle. The imago occurs from July to September.

Habitat, etc. It is apparently confined to the broom (*Cytisus scoparius*), and may be recognised by its very deep green colour, the deepest green of all our *Orthotyli*.

Distribution. It occurs throughout Europe, and in Algeria and Asia Minor, and is often extremely abundant. In Britain it is recorded definitely from nineteen English counties, and doubtfully from one other, viz. definitely from the coast counties extending from Norfolk to Cornwall, together with Cumberland, Durham, Notts, Leicester, Hereford, Glo'ster, Bucks, Surrey, Berks, and Wilts, and doubtfully from Northumberland. The only Welsh records are from Carnarvon and Glamorgan, but it is found in both Scotland and Ireland.

368. **Orthotylus concolor** Kb.

Kb. Caps., 89, 119, & 155, 20 (1855); Saund., H.H.B.I. 291 (1892).

Ova and **Larvae**. Unknown.

Life-cycle. The imago occurs in August.

Habitat, etc. This species also inhabits broom (*Cytisus scoparius*) and furze, but appears to be but little known.

Distribution. It is recorded from Europe generally, and from Algeria. In Britain it has been reported from seven English counties, viz. Cumberland, Durham, Norfolk, Cambs, Kent, Surrey, and Wilts. There are no records for Wales; it is found in Scotland, but not in Ireland.

369. **Orthotylus adenocarpi** Perr.

Perr. Ann. S. Linn. Lyon (1857); Saund., H.H.B.I. 290 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{3}{4}$ mm. Green, with the wing-pads more or less fuscescent; dorsal surface furnished with a rather long, scattered, black pubescence, which does not spring from black points; a reddish ochreous spot at base of abdomen; antennae more or less fuscescent, third joint shorter than in those described under *O. chloropterus*, fourth joint much shorter than third; tarsi fuscous to black.

Life-cycle. The imago is found in July and August, maturing about the end of June.

Habitat, etc. This is another species frequenting broom (*Cytisus scoparius*). Norman records it also from oak, probably an accidental occurrence.

Distribution. It inhabits Central and Southern Europe. In Britain it has been found in six English counties, viz. Norfolk, Essex, Kent, Surrey, Sussex, and Somerset; there are no records from Wales, but it has occurred in Scotland, though not in Ireland.

370. **Orthotylus rubidus** Put.

Put. Ann. Soc. Ent. Fr., 219 (1874); Saund., H.H.B.I. 291 (1892).

Ova. Unknown.

Larvae. There are at least two forms of the larva, corresponding respectively to the type form of the imago and the var. *moncreaffi*; the former is pink and the latter green.

Life-cycle. The imago is found from June to October. Larvae may still be met with at the beginning of August.

Habitat, etc. It inhabits salt marshes, where it lives upon succulent plants, such as *Salsola*, *Arenaria*, *Salicornia*, etc. Edwards records it from under *Atriplex portulacoides*, and Morley (4) the var. *moncreaffi* from *Artemisia maritima*. This green var. was first found by Moncreaff amongst *Salicornia radicans* at Portsmouth. Reuter adds for the same var. *Chenopodium glaucum*. The colour of the type form harmonises well with the red tints of the *Salicornia*, and the green var. equally well with its green parts. It is an active insect, readily taking wing; it runs readily on the wet mud, if disturbed on its food-plant.

Reuter (12) gives five varieties as follows:

> (*a*) Lurido-rufescens vel auroreus, maculis sanguineis magis minusve adspersus, oculis cuneoque sanguineis, membrana obscurius fumata, iridescente, areolis pallescentibus, venis leviter rufescentibus. ♂ ♀.
>
> (*b*) *moncreaffi* D. & S. Virescens, unicolor, superne nigropilosus, pilis albis tomentosis, membrana levius fumata, areolis pallidis, venis pallide lurido-virentibus vel grisescentibus; post mortem saepe pallescens, vel pallido-variegatus. Long. ♂ $2\frac{3}{4}$–3, ♀ $2\frac{1}{4}$–$2\frac{3}{4}$ mm.
>
> (*c*) *salsolae* Reut. Ut praecedens, sed superne pallido-pubescens, pilis nigris destituta.
>
> (*d*) Ut praecedens, sed capite pronotoque antice fuscescentibus.
>
> (*e*) Fusco-nigra ♂ (sec. D. & S.).

Distribution. This species inhabits Central and Southern Europe, as well as Algeria. So far as the British Isles are concerned, it has been found in eight English counties, viz. the coast counties from Norfolk to Devon, except Essex, and from Berks; of these, Suffolk records var. *moncreaffi* only, and Berks and Dorset the type form only. There are no records for any other part of the British Isles.

371. **Orthotylus ericetorum** Fall.

Fall. Hem. Suec., i, 105, 55 (1829); D. & S., B.H. 343, 10 (1865); Saund., H.H.B.I. 292 (1892).

Ova. Unknown.

Larvae. Last instar just over 2 mm. Green, with a reddish ochreous spot at base of abdomen; dorsal surface provided with a scattered black pubescence. To be distinguished by the enlarged posterior femora, the terminal antennal joint which is nearly as long as the third, and the yellow cell-nerves.

Life-cycle. The imago occurs from July to October.

Habitat, etc. It lives on *Calluna vulgaris*, on which it is often abundant. McGregor mentions finding it in Scotland on sallows. Reuter adds *Erica*. There must be some other food-plant than species of *Ericaceae* at least occasionally resorted to, as follows from McGregor's observation above, and from the fact that I have found it in Bucks at a spot where there was no heath, though I could not trace it to any definite plant. Nevertheless, undoubtedly *Ericaceae*, and especially *Calluna*, constitute the normal means of support. It is preyed upon by hymenopterous insects of the group Fossores.

Distribution. It is found in practically the whole of Europe, in North Africa, and in Siberia. In Britain it is recorded from twenty-five English counties, viz. all the coast counties from Northumberland to Somerset, except Lincs and Dorset, together with Cumberland, Cheshire, Staffs, Derby, Notts, Leicester, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the only Welsh records are from Carnarvon and Glamorgan, but it is found in both Scotland and Ireland. In Carnarvonshire, notwithstanding the great amount of the food-plant, it is a scarce species.

From what has been said, it will be seen that this extensive genus is in great need of further investigation; great attention should be paid to the exact shade of colour, the pubescence, the relative length of antennal joints, and the genitalia.

372. **Hypsitylus bicolor** D. & S.

D. & S., E.M.M., xiv, 131 (Litosoma id.); Saund., H.H.B.I. 292 (1892).

Ova. Unknown.

Larvae. Last instar, $2\frac{1}{2}$ mm. Greyish-green, with wing-pads fuscescent, the dorsal surface provided with a scattered pilosity, consisting of rather stout black hairs springing from black dots; pronotum very transverse, wing-pads of moderate length; last antennal joint less than half as long as third; tarsi black. Probably the larvae here described were those of ♀♀.

Life-cycle. The imago is met with from July to September, but larvae may be found up to the middle of August.

Habitat, etc. It occurs on *Ulex europaea*, on which it is often abundant, and also on broom. The great disparity between the sexes should be noted.

Distribution. Very little seems to be known of this species. Outside our own country it is recorded only from France and Germany. In Britain it is a common insect, and has been recorded from nineteen English counties, viz. all the coast counties from Lincs to Devon, together with Hunts, Worcester, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan; it has not yet been found in either Scotland or Ireland; hence its northernmost limit is Lincolnshire.

373. **Loxops coccinea** Mey. (Pseudoloxops id. Osh. Cat.).

Mey. Caps., 75 (1843); Saund., H.H.B.I. 294 (1892).

Ova. Unknown.

Larvae. Last instar, 3½ mm. Green with a crimson streak running from base of antennae through the red eye and along the margins of pronotum, and fading away towards end of wing-pads; legs yellow, hind femora at apex orange, tarsi with last joint more or less black; a red spot at base of abdomen; body ovate, broadest at middle of abdomen; head as seen from above, rounded in front; pronotum very transverse with angles somewhat rounded; fore parts with long black bristly hairs; abdomen with a few long, scattered, fine, blackish hairs, which are more numerous behind; antennae short and rather stout, third and fourth joints together shorter than second, fourth a little shorter than third; basal joint with stout, black bristly hairs, second joint with long pale hairs; tibiae with long hairs, posterior femora also with long hairs on the anterior margin towards the apex.

Life-cycle. The imago has been found in August and September, and the above full-grown larva was taken on August 10th, 1916, in a rather late season.

Habitat, etc. This very beautiful insect inhabits ash trees, and chiefly those that are in fruit. They seem to be attracted to the "keys," the juices of which probably form their food.

Distribution. It inhabits Central and Southern Europe. In Britain it has occurred in eighteen English counties, viz. the five coast counties from Norfolk to Sussex, together with Durham, Notts, Cambs, Oxon, Herts, Middlesex, Surrey, Berks, Wilts, Somerset, Glo'ster, Devon, and Cornwall; the only Welsh record is from Glamorgan, and it has not been found in either Scotland or Ireland. Hence its northernmost limit is the county of Durham.

374. **Heterotoma meriopterum** Scop.

Scop., E.C. 382 (1763); D. & S., B.H. 438 (1865); Saund., H.H.B.I. 295 (1892).

Ova. Unknown.

Larvae. Penultimate instar, 2 mm. Greenish-red, with pale greenish-yellow legs, and tarsi more or less fuscous; antennae red, with third joint luteous; second joint very much incrassated and densely hairy, first joint swollen; body nearly parallel-sided, head triangular, pronotum very transverse; wing-pads rather long for this stage; fore parts with erect black hairs, abdomen also pilose, but with hairs shorter and less erect.

Last instar, 3 mm. Similar, but with body much broadened behind, second antennal joint and wing-pads much longer, pilosity of abdomen fine, long, and pale, that of other parts stout and black, more or less erect. The peculiar structure of the antennae easily identifies this insect.

Life-cycle. The imago is found from July to October, maturing about the last week in June.

Habitat, etc. It occurs on nettles and many other low plants, of which Reuter (12) specially mentions *Verbascum lychnis*, *Artemisia absinthium*, *A. campestris*, *Origanum vulgare*, *Eupatorium cannabinum*; it is commonly found also on the mixed vegetation of hedges, and according to Reuter (12), on *Corylus*, *Quercus*, *Alnus*, *Populus*, *Cornus sanguineus*, and on Coniferae. It has been found to be destructive to the eggs of certain butterflies. Mr. Cecil Floersheim noticed that it attacked the eggs of *Papilio machaon* and *P. asterias*, in his open-air butterfly house. It pierced the ovum and fed on the contents, leaving only the iridescent shell. The attacks were made in some cases while the bugs were in their last larval instar, but chiefly in the imaginal state, and they lasted from May to August, being most abundant in June and July. *Papilio philenor* did not seem to be attacked. This illustrates what is probably true of many species of *Capsidae*, that, while they are normally vegetarian in diet, they are prepared, when the occasion offers, to become carnivorous, and *Heterotoma* was in this instance probably taking advantage of the unusual supply of tropical delicacies which were within easy reach.

Distribution. It is distributed over the whole of Europe, and also in Algeria and Tunisia. In Britain it is a common species and has been recorded from twenty-eight English counties, viz. all the coast counties from Yorks to Glo'ster, together with Lancs, Cheshire, Salop, Notts, Leicester, Cambs, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; from the Welsh counties of Carnarvon, Carmarthen, and Glamorgan, and from Ireland, but not from Scotland. It is curious that there are no records for this very common insect from further north than Yorkshire.

375. **Heterocordylus genistae** Scop.

Scop. Ent. Corn., 134 (1763); D. & S., B.H. 433 (1865) (leptocerus); Saund., H.H.B.I. 296 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to August.

Habitat, etc. It occurs on broom and also on *Genista tinctoria* (Carr, Edwards, and Bold), and to these Reuter (12) adds *G. ovata* and *G. anglica*, especially on the plants on which Aphides occur, and on these they appear to feed (Scholz). It is a gregarious species, and where present is usually found in considerable numbers.

Distribution. It inhabits most parts of Central and Southern Europe. In Britain it is not a very common species, but has been recorded from fourteen English counties, viz. Northumberland, Cumberland, Yorks, Cheshire, Notts, Norfolk, Oxon, Bucks, Kent, Sussex, Hants, Dorset, Wilts, and Somerset ; the Welsh records are from Glamorgan and Pembroke, and it is found in Scotland, but has not yet been discovered in Ireland.

376. **Heterocordylus tibialis** Hahn. (H. leptocerus Kb. Osh. Cat.).

Hahn, Wanz., i, 128, fig. 66 (1831) ; D. & S., B.H. 434 (1865) ; Saund., H.H.B.I. 296 (1892).

Ova. Unknown.

Larvae. 2nd Instar, $\frac{3}{4}$–$1\frac{1}{4}$ mm. Head and thorax fuscous with a central reddish ochreous line to the latter, showing the line of fission of the larval skin at the moult ; this ends in a very broadly opening V-shaped mark on the head ; abdomen red, with some markings at base and apical segment fuscous ; ultimately the abdominal segments show their posterior margins slightly ochreous ; legs and antennae stout, fuscous with a slight reddish tinge ; joints of antennae equally broad, second joint longest, last two of equal length ; surface glabrous.

3rd instar, $1\frac{1}{4}$–$1\frac{1}{2}$ mm. As before, but with each abdominal segment with an indistinct transverse fuscous fascia, and the posterior margin distinctly ochraceous ; a few small black hairs at extremity of apical segment, and an extremely fine pale pubescence over the fore parts.

4th instar, $2\frac{1}{2}$ mm. As before, but with rudimentary wing-pads, and abdominal segments each with a central fuscous bar, continued on each side as an ochreous fascia, a row of black spots on each side, one on each segment ; two terminal antennal joints slightly thinner than the rest.

5th and last instar, 3 mm. As before, but with wing-pads fully developed, extending half-way down the abdomen ; pubescence more distinct ; all the colours deepened, fore parts nearly black, each abdominal segment red with a transverse ochreous line, followed by a broad blackish bar, and that by the ochreous posterior margin ; the black dots are at the junction of the connexivum with the central part of the abdomen ; last two segments more or less black ; two terminal antennal joints narrower than the rest ; second joint rather thick, but not conspicuously so ; the fore parts dull and more or less rugose ; eyes projecting somewhat beyond front margin of transverse trapezoidal pronotum.

Life-cycle. The imago occurs from May to August. The majority, however, do not mature till the latter part of June. The youngest larvae described above were taken May 8th, 1915, and the later instars June 12th, 1915. Both this and the preceding species are rather earlier than the majority of the *Capsidae.*

Habitat, etc. This species inhabits broom, and occasionally *Genista* (Reuter) ; Parfitt found it by sweeping rough herbage. Buchanan White once found many individuals of this species stranded on a snow-drift on Ben Macdhui at a height of 4000 feet, and he regards this as an instance of involuntary migration. It is a gregarious species, and when present is usually found in considerable numbers.

Distribution. This insect is generally distributed in Europe. In Britain it is commoner than the preceding, and is recorded from sixteen English counties, viz. Northumberland, Cumberland, Westmorland, Durham, Yorks, Cheshire, Notts, Norfolk, Suffolk, Oxon, Essex, Kent, Surrey, Sussex, Devon, and Cornwall. There are no Welsh records, but it is found in both Scotland and Ireland.

377. **Malacocoris chlorizans** Fall.

Fall. Hem. Suec., 1, 52, 10 (1829); D. & S., B.H. 383 (1865); Saund., H.H.B.I. 293 (1892).

Ova. Length $\frac{2}{3}$ mm. Cylindrical, rather broad, truncated anteriorly, rounded posteriorly; slightly bent anteriorly, widest a little below the collar; colour yellowish-white.

Larvae. The larva described by Reuter (2) under this heading, and queried by him as representing this species, certainly does not belong to it. I have specimens of the larva he describes and it probably belongs to *Phylus melanocephalus*.

The true larva of *Malacocoris* is as follows:

Last instar, $2\frac{1}{2}$–$2\frac{3}{4}$ mm. Elongate, very pale and delicate green, without spots, except a red one at base of abdomen; dorsal surface with a long, scattered, and very fine pilosity; head similar to that of adult, with eyes prominent and not touching pronotum; pronotum trapezoidal, narrower than wing-pads; wing-pads rather long; apex of tarsi very slightly infuscated. The shape of the head will easily identify this insect.

Life-cycle. The imago occurs from June to October. The above larvae, however, were taken in August, and the majority of specimens probably do not mature till near the end of July.

Habitat, etc. This beautiful insect occurs with us mainly on the leaves of *Corylus avellana*, but J. E. Mason has found it upon ash, Carr on *Populus* and apple trees, and according to Reuter (12), it occurs also on *Alnus*, *Carpinus*, *Ulmus*, *Tilia*, *Betula*, *Salix*, and *Philadelphus coronarius*.

Reuter (12) describes two varieties thus:

> (*a*) *smaragdinus* Fieb. Hemielytris totis unicoloriter dilute viridibus, membrana hyalina venis apiceque areolarum viridibus.
>
> (*b*) *sulphuripennis* Westh. Pallide sulphureus, hemielytris pellucidis sulphureo-tinctis; cetero ut in typo.

Var. (*a*) is occasionally found with us, but I have not seen var. (*b*).

Distribution. It is found throughout Europe and in Algeria. In Britain it is a common insect, though never so numerous on any given tree as the two preceding species. It is recorded from twenty-six English counties, viz. all the coast counties from Northumberland to Glo'ster, together with Cumberland, Cheshire, Notts, Leicester, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, and Wilts; the Welsh records are from the counties of Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

Sub-family VI. **Phylina.**

The *Phylina*, which, while having no pronotal ring, are yet provided with a hamus to the wing-cell, contain a large number of genera of world-wide distribution, though they find their greatest development in the Palaearctic Region. According to Reuter, this province contributes 80 genera to the total, most of which are peculiar to it. Oshanin's Catalogue gives 400 species distributed among these 80 genera. Our British representatives number only 50 species, or one-eighth of this large number, but these include some of the commonest of all the *Capsidae*. The Phylina are divided into two very unequal groups, the Phylaria, and the Boopidocoraria, of which the latter contains only a single genus. We are here concerned only with the former.

Division *a*. *PHYLARIA*.

This group consists chiefly of small species; only two, *Oncotylus viridiflavus* and *Harpocera thoracica*, are more than 6 mm. long, while the majority range between 3 and 4 mm., and a few do not exceed 2 mm. Rather more than half of them inhabit trees, while the rest are to be found on low plants. The majority are extremely fragile and delicate. The genera may be thus distinguished:

1.	(16)	Elytra dull or very slightly shining, never clothed with pale, deciduous, scale-like pubescence	
2.	(3)	Arolia longer than the claws	1. *Onychumenus.*
3.	(2)	Arolia shorter than the claws	
4.	(5)	Tibiae spotted with black	2. *Oncotylus.*
5.	(4)	Tibiae not spotted with black	
6.	(15)	Claws not extremely short	
7.	(14)	Rostrum not extending to posterior coxae	
8.	(9)	Upper surface subglabrous; pubescence exceedingly fine	3. *Conostethus.*
9.	(8)	Upper surface pilose	
10.	(11)	Colour more or less ferruginous brown	4. *Hoplomachus.*
11.	(10)	Colour paler, not ferruginous brown	
12.	(13)	Xyphus concave	5. *Megalocoleus.*
13.	(12)	Xyphus convex	6. *Tinicephalus.*
14.	(7)	Rostrum reaching beyond posterior coxae	7. *Amblytylus.*

15.	(6)	Claws extremely short	8. *Macrotylus.*
16.	(1)	Elytra shining, sometimes clothed with pale, deciduous pubescence	
17.	(18)	Second joint of antennae shorter than third	9. *Harpocera.*
18.	(17)	Second joint of antennae longer than third	
19.	(26)	Tibiae with pale spines	
20.	(21)	Sexes very dissimilar, ♀ brachypterous	10. *Byrsoptera.*
21.	(20)	Sexes not very dissimilar, ♀ macropterous	
22.	(25)	Elongate, 5–6 mm.	
23.	(24)	Antennae black	11. *Brachyarthrum.*
24.	(23)	Antennae pale	12. *Phylus.*
25.	(22)	Not elongate, 3–3½ mm.	13. *Plesiodema.*
26.	(19)	Tibiae with black spines	
27.	(38)	Vertex not carinate	
28.	(31)	Elytra clothed with deciduous scale-like pubescence	
29.	(30)	Second joint of antennae not much thickened, never fusiform	14. *Psallus.*
30.	(29)	Second joint of antennae much thickened, in ♀ at least fusiform	15. *Atractotomus.*
31.	(28)	Elytra clothed with fine, regular hairs	
32.	(37)	Posterior legs not saltatory	
33.	(36)	Tibiae with black spots	
34.	(35)	Claws longer	16. *Plagiognathus.*
35.	(34)	Claws shorter	18. *Neocoris.*
36.	(33)	Tibiae without black spots	20. *Asciodema.*
37.	(32)	Posterior legs saltatory	17. *Chlamydatus.*
38.	(27)	Vertex carinate	19. *Sthenarus.*

378. **Onychumenus decolor** Fall.

Fall. Hem. Suec., i, 123, 16 (1829) ; D. & S., B.H. 393 (1865) ; Saund., H.H.B.I. 297 (1892).

Ova. Length, 1 mm. Colour yellow ; tubular, not very long in proportion to breadth, rounded posteriorly, curved rather abruptly at a point rather more than half-way towards anterior end, which is truncate nearly horizontally.

Larvae. “ Nympha : Flavicanti-grisea, opaca, dorso thoracis leviter fuscescenti, linea media percurrente pallidiore, antennis, rostro, tibiis, tarsis rudimentisque alarum fusco-griseis, his elongatis ; dorsi abdominis stria transversali utrinque abbreviata, in triente anteriori sita, nigra notato ” (Reuter, 2).

Life-cycle. The imago appears at the end of June and occurs throughout July and August.

Habitat, etc. This species occurs in dry and grassy fields, and according to Reuter on *Chrysanthemum* and various species of *Hieracium*. Morley (4) records it from *Polygonum*, and says that it flies in the sunshine. Douglas and Scott (1) add that it is sometimes found amongst ferns. This species is very curious in the size of the arolia, which, one would suppose, must interfere with the stability of its hold upon plants.

Distribution. It is recorded from Europe generally, from Algeria, and from North America. In Britain it has occurred in sixteen English counties, viz. the coast counties from Norfolk to Devon, together with Cumberland, Yorks, Notts, Hereford, Oxon, Bucks, Herts, and Surrey ; the only Welsh record is from Glamorgan, and there are none from either Scotland or Ireland.

379. **Oncotylus viridiflavus** Goeze.

Goeze, Ent. Beitr., ii, 267 (1778) ; D. & S., B.H. 385 (1865) (setulosus) ; Saund., H.H.B.I. 297 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago may be found from July to September.

Habitat, etc. It occurs on the flowers of *Centaurea nigra*, on both chalky and clay soils. It appears to be very local, but is occasionally present in some abundance, especially on the Surrey hills. Douglas and Scott say that " it gives off when handled an exceedingly agreeable odour, much resembling that of ripe jargonelle pears." It is our solitary representative of a large genus, most of which belong to the more eastern parts of the province, and none are common.

Distribution. The continental records are meagre, and comprise Central Europe and S. Russia ; it occurs also in Asia Minor. In Britain it is recorded from seven counties only, Suffolk, Herts, Essex, Kent, Surrey, Sussex, and Devon, and there are no records from either Scotland, Ireland, or Wales. Thus, its chief area is in the S.E. of England.

380. **Conostethus salinus** J. Sahl.

J. Sahlb. Not. S.F.F.F. Förh., 296 (1870) ; Saund., H.H.B.I. 300 (1892).

Ova. Length $\frac{3}{4}$ mm. Yellowish, tubular, nearly straight for two-thirds of its length from the rounded posterior end and then rather abruptly curved, collar upright, anterior end obliquely truncate.

Larvae. Young larvae (first or second instar). Short and broad, dull light green ; head and thoracic segments dark grey with a white central line, ending on the head in a broad V-shaped mark, the arms of which are carried to a point just in front of the eyes ; lateral margins of thoracic segments yellowish ; eyes red ; on each abdominal tergite a short indented black line marking off the connexivum ; legs yellowish-grey, claws black ; antennae dark grey; antennal joints in order of length, beginning with shortest, 1, 2, 4, 3; between third and fourth abdominal tergites two black points indicating situation of scent-glands.

Life-cycle. The imago occurs in June and July.

Habitat, etc. It inhabits salt marshes, and is said to occur on *Arenaria maritima*, but I have found it much more commonly by sweeping amongst various grasses growing in such spots and also on *Atriplex portulacoides.* According to Reuter it frequents also *Glyceria distans v. pulvinata,* on which Sahlberg first found it. J. Edwards (1) considers that it mimics the green form of *Orthotylus rubidus*, in company with which it occurs, the proportion of the *Conostethus* to the *Orthotylus* being about 10 per cent.

The body of the ♀ is green in life, with the dorsal surface black, and the elytra vary in coloration, being frequently almost reddish, but these colours soon pass away after death. The insect is very lively in hot sunshine, especially the ♂.

The ♀ is slightly dimorphic; in the brachypterous form the membrane sometimes does not reach farther than the base of the genital segment, while in the macropterous it passes the extremity of the abdomen. In the former also the pronotum is a little narrower, and the outer margin of the hemielytra a little more rounded.

Distribution. Very little is known of this insect; it is recorded from Northern and Central Europe and from the country beyond the Caspian. In Britain it has occurred chiefly in widely separated localities; it is recorded from six counties only, Cumberland, Durham, Lancs, Norfolk, Essex, and Kent, the localities in the last two counties being on the estuary of the Thames. There are no records from either Wales, Scotland, or Ireland. But though so local, it is, judging from my own experience, extremely abundant where it occurs. I have found it in great numbers on a salt marsh at Canvey Island, near Southend.

381. **Conostethus brevis** Reut.

Reut., E.M.M., xiv, 77; Saund., H.H.B.I. 300 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in July.

Habitat, etc. Like the preceding, this species inhabits salt marshes, where it is said by Norman to occur on *Statice.* The same observer found it also on thrift and *Carices.*

It is dimorphous in the same way as *C. salinus.*

Distribution. Still less is known of this insect than of the preceding. Hitherto it has been found only in Scotland, where it was detected during a visit of Prof. Reuter by the professor's wife; other specimens were afterwards found by Mr. George Norman. Forres is the only known locality.

382. **Conostethus roseus** Fall.

Fall. Hem. Suec., i, 124, 17 (1829); D. & S., B.H. 398 (1865); Saund., H.H.B.I. 301 (1892).

Ova. Unknown.

Larvae. The larvae in their intermediate stages are wholly green. In the last instar, $2\frac{1}{3}$ mm., the head is brownish-grey, and yellowish-white in front; the central lobe with central and lateral black lines, the central one continued upwards on to the face; on the face, above the central lobe, two sets of indistinct and broken brownish lines, running transversely and separated from one another by a longitudinal space concolorous with the rest of the face; eyes red; between the eyes and nearer to them than to one another are two dark brown roundish spots, reminding one of ocelli; from each of these runs a narrow yellow line diagonally towards the vertex, where they meet, and are then continued as a single longitudinal line, which is continuous with a central yellow line on pronotum and scutellum, thus making altogether a Y-shaped mark; pronotum very transverse, brownish-grey, with yellow central line and yellow lateral margins; the callosities appear as a series of small, bare, dark brown patches on each side, bounded posteriorly by a similar sinuous line, these lines on the two sides forming, except where they are interrupted by the yellow central line, a regular undulating curve; scutellum and base of abdomen coloured as pronotum; wing-pads rosy-grey, bounded outwardly by a broad, irregular, yellow margin; at their base a dark line on each side, of the same nature as the markings on the pronotum; abdomen bright green in the centre; connexivum broadly greenish-yellow; the pale margins of pronotum, wing-pads, and abdomen form a kind of continuous frame in which the body is set; a dark spot on each segment where the two colours meet; legs greyish-yellow; tarsi more or less infuscated, claws black; femora slightly spotted; tarsi with black spines inwardly; antennae with basal joint and more or less of second joint greyish-yellow, the rest fuscous, covered with very short, black hairs; tarsi two-jointed; antennae four-jointed; a short black streak on the scent-glands.

Life-cycle. This is one of our earlier species. The imago matures at the end of May, and occurs throughout June and into July. Wilkinson found it in the latter month in Yorks and Suffolk, but it is as a rule, with us, a spring species.

Habitat, etc. Unlike the two preceding, this species frequents, as a rule, dry sandy or chalky places. It may be found by sweeping grass and other low herbage, and is common where it occurs, though decidedly local. At Scarborough it was taken by Wilkinson amongst *Lithospermum officinale*, and *L. arvense*, and on the flowers of *Echium vulgare*. Morley (4) records it from *Trifolium arvense* and beneath stones. I have found it on Royston Heath, in parts where the vegetation is dwarfed; here it occurred chiefly on a fine grass which was, however, closely intermingled with other plants, such as *Thymus*, etc. I could not, however, find it feeding, although I watched many specimens for a long time. In captivity I saw one imago pierce the grass with its rostrum. Reuter gives the food-plant as *Trifolium montanum*. It is preyed upon by Fossorial Hymenoptera. The antennae are carried pointing straight forward when at rest, and the body is inclined at an angle to the surface on which it rests, with the fore parts raised.

Distribution. This species is much more widely distributed than the two preceding. It occurs over Europe, as well as in N. Africa, Asia Minor, Syria, and Siberia. In Britain it has been found in eleven counties, Yorks, Lancs, Norfolk, Suffolk, Northants, Herts, Essex, Kent, Surrey, Berks, and Wilts. There are no records from Wales, Scotland, or Ireland.

383. **Hoplomachus thunbergi** Fall.

Fall. Hem. Suec., i, 105, 56 (1829); D. & S., B.H. 396 (1865); Saund., H.H.B.I. 30 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from May to August.

Habitat, etc. This species occurs in dry places amongst low herbage, and especially on flowers. It has been recorded from *Hieracium pilosella* and other species of the genus, and from *Anthyllis* and *Ononis* (Parfitt). Fieber says it occurs on dry hilly places overgrown with short grass. Reuter (12) records it also from *Galium* and *Chrysanthemum*.

It is variable in colour, ranging from greenish-grey to deep reddish-brown, though there is usually enough of the latter to enable it to be recognised.

Distribution. This insect is generally distributed on the Continent, though distinctly rare in Britain. It occurs also in Algeria. It has been recorded from eleven English counties, Derby (a doubtful record), Leicester Worcester, Glo'ster, Oxon, Essex, Kent, Surrey, Somerset, Devon, and Cornwall. There are no records from either Wales, Scotland, or Ireland.

384. **Megalocoleus pilosus** Schr.

Schr. Fu. Boi., ii, 871 (1801); D. & S., B.H. 394 (1865) (tanaceti); Saund., H.H.B.I. 303 (1892) (tanaceti).

Ova. Unknown.

Larvae. Uniformly green, covered with strong black hairs, which extend to antennae and legs.

An intermediate instar, 2 mm., either third or fourth, shows a very transverse pronotum and the beginnings of wing-pads; antennae stout, with the second joint a good deal thickened; tarsi slightly infuscated, especially at apex.

Last instar, 2½–3½ mm. Similar, wing-pads extending to third abdominal segment; tarsi black at apex.

Life-cycle. The imago occurs from July to September, though the majority mature about the beginning of August or end of July.

Habitat, etc. It is found on the heads of tansy (*Tanacetum vulgare*), and where this plant is plentiful, especially by riversides, the insect may be expected to occur commonly. It has also been found on *Achillea millefolium*, and Douglas and Scott mention its having been taken on bramble bushes. When on the tansy-heads, the insect is, of course, well concealed by the likeness of its colour to that of the flowers. It is curious that both the above food-plants are distinguished by a strong aromatic smell and taste, which may, perhaps, be the attraction. Several other species, equally or even more intense in their yellow coloration, are known in the Palaearctic Region, but it is curious that this is the only one that has black bristles on the fore coxae, all the others having them pale.

Reuter (12) describes a variety of the male thus:

"Aurantiaco-flava, pronoto postice, macula basali scutelli, clavo toto, corio fascia lata apicali cuneoque, basi excepta, virescenti-fuscis, membrana obscurius fumata."

The ♂ is with us far less common than the ♀, but I believe most of the specimens of that sex incline more to the above var. than to the type form.

Distribution. *M. pilosus* is found chiefly in Northern and Central Europe and Siberia. In Britain it is reported from twelve English counties, Durham, Yorks, Notts, Norfolk, Worcester, Hereford, Monmouth, Glo'ster, Oxon, Surrey, Devon, and Cornwall. In Hereford and Monmouth it is specially associated with the Wye Valley, on the banks of which river the tansy grows plentifully. Hallett has taken it in Glamorgan, and it is recorded also from Scotland, but not from Ireland. The banks of the Wey in Surrey, and of the Wye in Herefordshire, yield it abundantly.

385. **Megalocoleus molliculus** Fall.

Fall. Hem. Suec., i, 82, 12 (1829); D. & S., B.H. 387 (1865); Saund., H.H.B.I. 303 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to September, though the majority appear to mature in July.

Habitat, etc. It occurs principally on the flowers of *Achillea millefolium*, but has been found on other plants as well, such as *Tanacetum vulgare*, and *Ononis*. When found on the *Achillea* it has the habit of keeping largely to the underside of the heads of flowers, the involucres of which it closely simulates, the dark markings on the hemielytra corresponding to the scarious edges of the involucral bracts, and hence is difficult to detect.

This species often closely resembles the preceding, especially in the

♂, but the colour is always greener and less yellow, the anterior coxae do not carry the black bristles, and the general black pubescence is less coarse. As they can be found on the same food-plants, these points should be noted, although it may be said that *M. pilosus* occurs most frequently on the tansy and *M. molliculus* on the yarrow.

Reuter (12) describes the following colour varieties :

> (*a*) Signaturis hemelytrorum fere obsoletis."
>
> (*b*) Luteus, supra pilis sparsis fuscis, vertice (♂) oculo magno tantum dimidio latiore ; cetero omnino ut supra (i.e. in the type). An species propria ? As regards the vertex, the description of the type is as follows : " vertice oculo circiter $\frac{3}{4}$ latiore."

The latter var. is from Berlin only.

This is a very delicate insect, and often suffers damage in the antennae.

Distribution. It is a very widely distributed insect, occurring throughout almost the whole of Europe, and in Algeria and Turkestan. In Britain, it occurs more widely than the preceding species, being recorded from twenty counties, including the coast counties from Norfolk to Cornwall, together with Northumberland, Durham, Notts, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts. It is also recorded from Scotland, but not from either Wales or Ireland.

386. **Megalocoleus hortulanus** Mey. (Tinicephalus id. Reut. & Osh. Cat.).

Mey. Caps., 77 (1843) ; Saund., H.H.B.I. 303 (1892).

Ova. Unknown.

Larvae. Last instar, 2¼ mm. Dull green, with wing-pads more or less clouded with pale fuscous ; fore parts, including wing-pads, with scattered black spots ; legs and antennae greenish-grey, without spots, but with fine, short, black hairs ; tarsi blackish ; antennae with third joint a little shorter than second, fourth a little longer than first ; head triangular ; pronotum trapezoidal, transverse.

Various instars, Box Hill, June, 1917. Dull green, more or less variegated with greyish-yellow in front and whole dorsal surface set with black hairs springing from black spots ; eyes reddish ; tibiae with black hairs, tarsi blackish ; wing-pads outwardly, legs and antennae greyish-yellow.

Life-cycle. The imago occurs from June to August, maturing about the middle of June ; the above larvae were taken on June 12th, 1915.

Habitat, etc. This species occurs mainly on *Helianthemum vulgare*, but it has been found also on *Ononis* and *Origanum*.

Distribution. It is found chiefly in Central and Southern Europe. In Britain it is recorded from nine English counties, viz. the coast counties from Suffolk to Sussex inclusive, together with Herts, Surrey, Wilts, Somerset, and Glo'ster. It has also been found in Scotland, but not in Wales nor in Ireland.

387. **Amblytylus delicatus** Perr.

Perr. Ann. S. Linn. Lyon, 167 (1867); Saund., H.H.B.I. 304 (1892).

I know nothing of the early stages or of the life-cycle of this insect.

Habitat, etc. In this country it has been found only on *Gnaphalium germanicum.*

Distribution. This is a very little known species; apart from our own country, it is recorded only from the South of France. In Britain it has occurred only in Surrey, where Saunders found it at Woking in 1888, and as the actual locality has now been destroyed, the chances of its recurrence are remote.

388. **Amblytylus brevicollis** Fieb.

Fieb. Crit. Phyt., 340 (1858); Saund., H.H.B.I. 305 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in July.

Habitat, etc. This insect is taken by sweeping grasses in localities similar to those in which *Onychumenus decolor* occurs, to the ♂ of which, at first sight, its ♂ presents considerable resemblance; the ♀ might easily be mistaken, on a superficial glance, for *Amblytylus affinis.* The ♂ can be distinguished from *Onychumenus* by the very differently shaped head, which in *Onychumenus* has the eyes remote from the pronotum, and the face shorter, but in *Amblytylus* has the eyes touching the pronotum and the face considerably produced. The very large arolia of *Onychumenus* will help to distinguish it, but with our English practice of gumming the insects on card, it is not very easy to see them. The ♀ may be distinguished at once from *A. affinis* by the fact that its pubescence is pale, while that of *A. affinis* is black.

Distribution. This, again, is a little known species. It inhabits Central and Southern Europe. In Britain it has been found in six counties, Yorks, Lancs, Kent, Surrey, Sussex, and Hants; there are no records from either Wales, Scotland, or Ireland.

389. **Amblytylus affinis** Fieb.

Fieb., Wien. Ent. Nach. 330 (1864); D. & S., B.H. 389 (1865); Saund., H.H.B.I. 305 (1892).

Ova. Length $\frac{3}{4}$ mm. Greenish-yellow, tubular, nearly straight, rounded posteriorly, rather abruptly bent anteriorly just before the collar, which projects and is convexly rounded anteriorly.

Larvae. The larva is greenish.

Life-cycle. The imago occurs from June to August, becoming mature towards the end of the former month.

Habitat, etc. It may be found by sweeping grasses, especially in dry places, but it occurs also at the roots of plants on wayside banks, where it may be taken by searching. Morley (4) found it on *Hypericum hirsutum*, and also in marshes. It is preyed upon by Fossorial Hymenoptera.

It varies a good deal in colouring; when freshly disclosed it is more or less greenish, especially the abdomen, but as the integument hardens this colour disappears and is replaced by ochreous. The dark clouds on the hemielytra are sometimes very distinct, or again, they may be almost wanting; the pronotum frequently has dark markings on its posterior half, which, however, appear to be markings beneath that show through. The black pilosity, large head and long rostrum, should always enable it to be recognised.

It should be noted that several other Palaearctic species of this genus have been described, one or two of which might possibly be found with us.

Distribution. It is not a widely distributed species, being recorded only from Central and Southern Europe and from Algeria. In our own country it has occurred in twelve counties, viz. the coast counties from Norfolk to Devon, except Dorset, and also from Cambs, Bucks, Herts, Surrey, and Wilts. There are no records from Wales, Scotland, or Ireland; hence the northern limit is Norfolk. It sometimes occurs in profusion, as, e.g. at Benfleet, Essex, June 27th, 1914, where I found it very abundant, but also very local. It is usually, however, not a common insect.

390. **Macrotylus solitarius** Mey.

Mey. Caps., 62 (1843); Saund., H.H.B.I. 298 (1892).

Ova. Unknown.

Larvae. Last instar, 3½ mm. Fore parts dull greyish-green, with wing-pads darker, and abdomen a brighter green; legs and antennae dull smoky green; body elongate oval, widest in middle; pronotum trapezoidal, with rounded angles; wing-pads elongate, rather more than half as long as the distance from pronotum to end of abdomen; a few stout black hairs on pronotum, springing from minute black spots, and placed chiefly in front and at sides; wing-pads similarly provided; whole dorsal surface of abdomen with rather remote similar hairs chiefly in transverse rows; legs and antennae hairy; claws appendiculate and strongly curved; first antennal joint short and stout, second and third subequal, more than three times as long as first, second rather stout, fourth about twice as long as first.

Life-cycle. The imago is found in July and August, maturing about the beginning of July.

Habitat, etc. Its chief food-plant is *Stachys sylvatica*, but Reuter records it also from *Ononis spinosa*, and Douglas and Scott give also *Ononis*.

Reuter (12) describes a variety thus:

"Areola majore membranae tota nigricante, macula limbi externi posteriore sub-evanescente."

Distribution. It occurs chiefly in Central and South-eastern Europe. In Britain it is not a common insect and has been taken in eight counties only, viz. Notts, Suffolk, Glo'ster, Oxon, Essex, Surrey, Sussex, and Wilts. In the last mentioned county I have found it commoner than elsewhere. There are no records from Wales, Scotland, or Ireland.

391. **Macrotylus paykulli** Fall.

Fall. Hem. Suec., i, 106, 57 (1829); D. & S., B.H. 388 (1865); Saund., H.H.B.I. 299 (1892).

Ova. Unknown.

Larvae. These are much like the adult and of a deep blackish-green colour with paler blue-green abdomen, and after death the deep green changes to a dirty greyish-brown. I have representatives of three instars, two of which are evidently the last two. They are similarly coloured, fore parts, antennae, and legs, deep blackish-green, i.e. dirty grey-brown after death, and abdomen bright blue-green in life, and pale green after death; the youngest of all, which is either the first or second instar, probably the latter, is paler than the rest. The youngest is rather under 1 mm. in length, the intermediate one 1½ mm., and the last instar 2 mm. Dorsal surface clothed with long, black, stout hairs, which on the abdomen at least are arranged with great regularity, running in transverse rows across the segments; no trace of the patchy distribution of the pilosity which obtains on the hemielytra of the adult; the hairs, as in the adult, are very easily detached, and sometimes the insect appears almost glabrous; legs and antennae stout and clothed with a short and almost indistinguishable, fine black pilosity. The insect can be distinguished by the extremely minute claws.

In the last instar, the wing-pads are large, extending halfway down the abdomen; in the preceding stage they are much shorter.

Life-cycle. The imago occurs from June to September, maturing continuously from the beginning of June onwards, for many stages are contemporaneous. Of the larvae mentioned above, the last instar was found at dates as far apart as May 26th and June 12th, both in the year 1915, while on the same May 26th the youngest stage described was taken also.

Habitat, etc. *M. paykulli* occurs on *Ononis*, both *O. arvensis* and *O. spinosa*. Reuter quotes *O. natrix* as well. According to Reuter also it has been found on *Inula graveolens*, but in this country I believe it is never seen apart from *Ononis*. It is a gregarious insect and usually occurs in great numbers, both on and under the plants. It is often accompanied by *Dicyphus annulatus* and *Metacanthus elegans*.

Reuter (12) describes three vars. as follows :

(*a*) Flavo-virens, maris segmento genitali feminaeque terebra nigris.

(*b*) Pectore medio, femoribus saltem posterioribus, segmento genitali, apice capitis flavescentis, callis pronoti apiceque scutelli fuscescentibus vel fuscis ; pronoto scutelloque saepe saturate prasinis, hemelytris virescenti-albis. ♂.

(*c*) Supra pallide flavo-virens, tantum apice scutelli nigricante ; subtus cum femoribus omnibus, basi articuli antennarum secundi latius saepissimeque etiam dimidio apicali capitis nigra, tibiis sordidis ; antennis, parte nigra excepta, ferrugineis ; saepe tamen lateribus pectoris et ventris magis minusve late flavo-virescentibus. ♀.

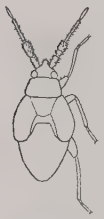
Distribution. A common insect, distributed over Europe and passing into Algeria, Tunisia, Syria, and North Turkestan. In Britain it is widely distributed and may be expected to turn up wherever *Ononis* occurs in sufficient quantity. It is recorded from twenty-five English counties, viz. all the coast counties from Northumberland round to Glo'ster, except Durham and Lincs, together with Cumberland, Lancs, Cheshire, Notts, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts ; there are Welsh records from Carnarvon, Carmarthen, and Glamorgan, and it has been found in Ireland, but not in Scotland.

392. **Harpocera thoracica** Fall.

Fall. Mon. Cim., 81, 45 (1807) ; D. & S., B.H. 469 (1865) ; Saund., H.H.B.I. 306 (1892).

Ova. Unknown.

Larvae. Last instar, 4 mm. Head short, rather sunk in pronotum ; eyes not prominent, pronotum large, trapezoidal, with rounded angles, and curved impressions on disc ; wing-pads, tapering rapidly to apex ; head, pronotum, scutellum and wing-pads reddish, with a central longitudinal white line continued to apex of scutellum ; wing-pads infuscated at apex ; abdomen reddish-brown between wing-pads, yellowish-red elsewhere, with connexivum yellow and a central pale line on its hinder part ; the whole surface set with stout black setae, which are truncate at apex, and sometimes almost clavate ; the abdominal setae are arranged in a transverse row of about six on each segment ; femora red, tibiae yellowish, tarsi infuscated ; antennae yellowish, with black setae, first joint cylindrical, moderate, second stout, a little longer than first, infuscated at apex, third much less stout, one and a half times as long as second, fourth a little longer than first ; claws black, straight, and suddenly curved at apex.



Nymph of *Harpocera thoracica* Fall.

An earlier instar, 2½ mm., is similar, but much darker ; antennae black, first two joints very stout, last two less so ; legs more or less blackish ; pronotum shorter.

This larva can always be recognised by the strong black setae and their peculiar arrangement on the abdomen.

Life-cycle. This is an early species ; the imago appears in April or early May, and is specially common in May and early June ; from that time onwards its numbers diminish, though stray specimens may sometimes be found as late as October.

Habitat, etc. This species occurs on hawthorn blossom, and also on oak ; but it has been found, in addition, on birch, hazel, and sallow. Parfitt reports it from heath, Morley (4) from *Choerophyllum*, and Curtis from grass. In S.W. France it has been found on juniper. It must be regarded, however, as chiefly an arboreal species.

Reuter (12) describes the following varieties :

> (*a*) Supra cum antennis nigro-picea tota, tantum carina verticis basique cunei flavescentibus ; subtus nigro-picea, rostro, coxis medioque ventris flavo-testaceis. ♀. (I have seen one English specimen of this from Bristol.)
>
> (*b*) Supra fuscescenti-testacea vel fuliginosa, capite, carina verticis excepta, callis pronoti, basi scutelli latissime cuneoque apicem versus piceis ; subtus nigro-picea, ventre medio macula maxima testacea ; antennis testaceis, apicem versus fuscis. ♀.
>
> (*c*) Capite, pronoto scutelloque nigro-piceis (♂) vel capite, callis pronoti basique scutelli piceis, pronoto scutelloque cetero flavo-ferrugineis (♀), capite linea media percurrente, maculis apicalibus verticisque carina, pronoto margine postico lineaque media longitudinali, scutello linea media vel tantum apice albidis ; hemelytris grisescenti-piceis (♂) vel flavo-testaceis (♀), cuneo piceo, basi late pallido-flavescente ; corpore subtus nigricante (♂) vel flavo-testaceo, lateribus ferrugineo, pectore medio piceo (♀) ; antennis maris et feminae dissimiliter coloratis.

Distribution. *H. thoracica* is found throughout Europe, and in Algeria and Northern Persia. In Britain it is one of our most characteristic spring species, synchronizing especially with the hawthorn blossom ; it has occurred in twenty-eight English counties, viz. all the coast counties from Northumberland to Glo'ster, together with Cumberland, Westmorland, Cheshire, Notts, Leicester, Cambs, Hunts, Warwick, Oxon, Herts, Surrey, Berks, and Wilts ; the only Welsh record is from Glamorgan, but it is found in both Scotland and Ireland.

393. **Byrsoptera rufifrons** Fall.

Fall. Mon. Cim., 105, 19 (1807) ; D. & S., B.H. 352 (1865) (caricis) ; Saund., H.H.B.I. 307 (1892).

Ova. Unknown.

Larvae. "Nympha: coccinea, subtiliter minus breve flavo-pilosa, antennis albis" (Reuter, 2).

Some larvae found at Burnham Beeches, June 22nd, 1912, were as follows: 2½ mm. long. Body shaped as in adult ♀, but not quite so broad in abdomen; uniformly dark reddish, with wing-pads darker; legs and antennae very pale greenish-yellow, so as to be almost invisible when the insect is on a leaf. After death the abdomen becomes bright scarlet. These probably represent the ♀ only.

Life-cycle. The imago occurs from June to October.

Habitat, etc. It occurs on *Urtica dioica* chiefly, but is also taken by sweeping long herbage generally. It is dimorphous, the ♂ being always macropterous and the ♀, so far as known, always brachypterous. As is usual with these dimorphous species, the ♀ is commoner than the ♂. The great breadth of the abdomen in the ♀ seems to imply great fecundity.

Distribution. It occurs throughout the whole of Europe, as well as in Asia Minor; an allied species is found in S. Russia. In Britain it has been recorded from twenty-two English counties, viz. the coast counties from Yorks to Cornwall, together with Salop, Notts, Hereford, Glo'ster, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; in Wales there are records from Carmarthen and Glamorgan; but there are none from either Scotland or Ireland; thus the northernmost limit is Yorkshire.

394. **Brachyarthrum limitatum** Fieb.

Fieb. Crit. Phyt., 335 (1858); E.M.M., li, 194.

The genus *Brachyarthrum* is closely allied to *Phylus*, of which it is by some authors considered a sub-genus. It differs chiefly in the much stouter black antennae, and in the fact that the sexes are somewhat dissimilar in both shape and coloration. Only one species is now contained in the genus, although Fieber originally included in it the insect now known as *Plesiodema pinetellum*.

B. limitatum is rather long, parallel-sided, slightly shiny, and closely covered with a pale pubescence. *Male*: head black, pronotum brownish-black with anterior margin narrowly yellowish; hemielytra blackish-brown, with base of cuneus yellowish and membrane fumose; wings fumose; antennae black with fourth joint brownish, first and second joints stout, third less so, fourth slender, second joint longer than third and fourth together, fourth much shorter than third; legs orange-yellow, tibiae black-spined and fuscescent at apex, tarsi fuscous, anterior margin of hind femora fuscescent; body black, segmental margins of abdomen ochraceous. *Female*: shorter than ♂, and with rather shorter membrane and antennae; head black; pronotum and hemielytra brownish ochraceous, cuneus clear orange-yellow, scutellum more or less fuscescent, membrane fumose; wings legs, antennae, and body as in ♂, save that the antennae are more slender throughout. Length ♂ 5 mm., ♀ 4½ mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been taken in July.

Habitat, etc. Very little is known as to the habits of this Capsid. Reuter records it from *Spiraea salicifolia* ; Morley found one specimen on *Digitalis purpurea*, and I have taken it in some numbers on aspen trees, on which their numbers and general distribution seemed to show that they were "at home" ; such a habitat is more in accord with what might be expected than the low plants mentioned above, for its near allies in the genera *Phylus* and *Plesiodema* are all arboreal in habits. It was accompanied by great numbers of *Orthotylus bilineatus* ; these latter, however, were almost all in the larval condition, while *Brachyarthrum* was mature : it is, therefore, a somewhat earlier insect than the *Orthotylus*. It is very active and readily takes flight ; when in the net, it might, but for this and its somewhat larger size, be mistaken for *Plagiognathus arbustorum*. In a later work, Reuter gives *Populus tremula* (aspen) as the food-plant.

Distribution. It is recorded from Northern and Central Europe. In Britain, the first specimen was taken by Mr. C. Morley on July 2nd, 1904, in Cutler's Wood, Freston, Suffolk. No others were taken till July 3rd, 1915, when I found the specimens referred to above in Epping Forest. Thus the insect has hitherto occurred in two counties only, Suffolk and Essex.

395. **Phylus palliceps** Fieb.

Fieb. Eur. Hem., 315, 2 (1861); D. & S., B.H. 355, 1 (1865); Saund., H.H.B.I. 308 (1892).

Ova. Unknown.

Larvae. Last instar, 3¾ mm. Testaceous, with abdomen brownish ; whole upper surface clothed with scattered, long, pale pubescence ; head triangular, eyes fuscous, almost touching pronotum ; pronotum trapezoidal, transverse, anterior angles rounded ; body elongate-oval, broadest just before apex of wing-pads, the latter with rounded margins, which are ciliated, extending about half-way down the body ; antennae with joints successively narrower ; tibiae with fine pale spines, tarsi two-jointed, first joint very short, second very long, claws pale, sharply curved. A younger larva (probably this species), 3 mm., is similar, but paler, and with wing-pads quite short.

Life-cycle. The imagines appear in June and last through July and into August. But there is a record also for May.

Habitat, etc. It occurs on oaks in company with the next species, though not so commonly. J. E. Mason records it from hazel and maple, and I have taken a specimen on alder. Reuter adds "in salicetis," and Douglas and Scott give "nut bushes."

Distribution. This does not seem to be a very common species; it is recorded from Central and Southern Europe. In Britain it has been found in twenty-five English counties, viz. the coast counties from Northumberland to Devon, except Durham, and from Westmorland, Cumberland, Lancs, Cheshire, Notts, Worcester, Glo'ster, Oxon, Herts, Middlesex, Surrey, Berks, Wilts, and Somerset. The only record from Wales is from Glamorgan; but it is found in both Scotland and Ireland.

396. **Phylus melanocephalus** L.

Lin., F.S. 974 (1761); D. & S., B.H. 355, 2 (1865); Saund., H.H.B.I. 308 (1892).

Ova. Unknown.

Larvae. I have the following larvae which I believe belong to this species: Last instar. Length 3 mm. to 3½ mm. Fusiform, reddish ochreous throughout; head triangular, eyes black; pronotum transverse, trapezoidal; wing-pads extending more than half-way down body; antennae with base and apex of second joint and apex of third black; apex of tarsi and rostrum slightly infuscate; a few long pale hairs scattered over the body. If this is correctly determined, it is remarkable that the black in the larvae is in the antennae, whereas in the adult it is in the head.

Life-cycle. The imago appears usually in June and lasts through July and into August; on the Continent it has been taken in May.

Habitat, etc. It occurs on oaks with the preceding species. Douglas and Scott (1) give "nut bushes," Morley (4) has taken it on poplar, and Carr records it from birch. Reuter adds "in fagetis" and on rose in France. The intensity of coloration varies a good deal, and of course the newly or recently disclosed insects are much paler than those that have been some time mature. Reuter (12) thus describes a pale variety, which is really only the recently disclosed insect:

"Supra albicans, capite nigro-fusco, cetero ut in var. typica."

Distribution. It is distributed over the whole of Europe and in Algeria. In Britain it is recorded from twenty-seven English counties, including all the coast counties from Northumberland to Glo'ster except Yorks, together with Westmorland, Cumberland, Cheshire, Notts, Leicester, Cambs, Warwick, Oxon, Bucks, Herts, Middlesex, Surrey, and Berks. The only Welsh record is from Glamorgan, and it is found in both Scotland and Ireland.

397. **Phylus coryli** L. and var. **avellanae** Mey.

Lin., F.S. 974 (1761); D. & S., B.H. 356, 3, & 357, 4 (1865); Saund., H.H.B.I. 308 (1892).

Ova. Unknown.

Larvae. I have a larva which is probably that of var. *avellanae*. It is very much like that of *P. palliceps* (q.v.) but a little smaller, and duller, with the fore parts of a more greyish testaceous colour, the abdomen blackish in the centre, and the apex of the tarsi slightly infuscated. In other respects they are practically indistinguishable.

Life-cycle. The imago occurs from June to September, and on the Continent has been found in May.

Habitat, etc. This species, in all its forms, occurs on *Corylus avellana*. Morley (4) records it also from *Heracleum sphondylium*, probably an accidental occurrence. The var. *avellanae* has occurred also on ash (Parfitt).

Reuter (12) thus describes the type :

> "Niger aut nigro-fuscus, antennis pedibusque pallide vel albido-flavis, illis articulo primo ipsa basi fusco ; membrana aequaliter nigricante ;" and *avellanae* and its two chief forms as follows :
>
> "Supra griseo-fuscescens, rufo-fuscescens vel griseo-rufescens, antennis pedibusque pallide flavescentibus, illis articulo primo ima basi fusco, membrana aequaliter nigricante.
>
> (*a*) "Supra fere unicolor, cuneo obscurius rufescente.
>
> (*b*) "Griseo-rufescens, pronoto antice, scutello parte basali, punctis duobus basalibus exceptis, et apice, margine externo corii apicem versus cuneoque rufo-piceis."

Distribution. The type form occurs over the whole of Europe, and the var. *avellanae* in the central parts. In Britain the var. is much commoner than the type, but as the records do not always discriminate between the two, the distribution can only be given for them collectively. It is as follows : twenty-six English counties, viz. the coast counties from Lincs to Glo'ster, together with Northumberland, Cumberland, Derby, Notts, Leicester, Cambs, Hunts, Warwick, Oxon, Herts, Surrey, Berks, and Wilts ; there are Welsh records from the counties of Carnarvon, Brecknock, Carmarthen, and Glamorgan ; and both forms are found in Scotland and Ireland. Of the above Cumberland, Cheshire, Derby, Notts, Leicester, Hunts, Berks, Cornwall, and Carnarvon record the type form only, and Northumberland, Cambs, Herts, Wilts, and Glamorgan, the var. *avellanae* only.

398. **Plesiodema pinetellum** Zett.

Zett. Faun. Ins. Lap., 494, 22 (1828) ; Saund., H.H.B.I. 309 (1892).

Ova. Unknown.

Larvae. "Nympha (adulta) : Testaceo-livida, oculis fuscis, supra subtiliter et parce albo-pubescens, rudimentis alarum postice saepe nigricantibus" (Reuter, 2).

Life-cycle. The imago occurs from May to August.

Habitat, etc. It occurs on the Scotch fir (*Pinus sylvestris*) ; but it has also been found on *Picea excelsa* in Baden, *Larix europaea* in Alsace, and *Pinus halepensis* in the South of France. According to Reuter it has been found also on oak and *Salix*, the former in various countries and the latter in Lapland.

Reuter (12) describes the following varieties :

> (*a*) " Nigro-fusca, hemelytris dilute nigro-fuscis, vena corii cubitali cuneoque fusco-ochraceis, hoc basi pallidiore, venis membranae obscure testaceis.
>
> (*b*) " Obscure fusca, antennis, pedibus hemelytrisque obscure testaceis, his embolii apice cuneoque, basi excepta, leviter fuscescentibus ; antennis articulo secundo duobus ultimis simul sumtis paullulum breviore. ♀. (Ex Algeria ; an species distincta ?)
>
> (*c*) " Fusca vel fusco-testacea, pronoti margine basali plerumque anguste fusco, hemelytris flavo-testaceis, embolio apicem versus cuneoque subochraceis ; hoc basi pallido ; venis membranae pallido-testaceis, areolis sub-hyalinis. ♀."

Distribution. It is found in Europe generally and in Algeria. As regards the British Isles it has thus far been found only in Scotland and Northumberland and Cumberland (Blatch).

399. **Psallus ambiguus** Fall.

Fall. Mon. Cim., 89, 64 (1807) ; D. & S., B.H. 406 (1865) (obscurus) ; Saund., H.H.B.I. 312 (1892).

Ova. Length 1 mm. Yellowish ; tubular, a long, narrow egg, slightly curved, rounded posteriorly, truncated slightly obliquely in front, with collar broader than the body of the egg.

Larvae. I have two larvae which appear to belong to this species ; they are in the last instar, and measure $3\frac{3}{4}$ mm. in length. Fore parts shining reddish testaceous, abdomen rather dull, pale greyish-testaceous, with central part blackish, through showing contents of abdomen through the skin ; legs testaceous, apex of tibiae, basal joint of tarsi, apical half of second joint, and claws blackish ; antennae with basal joint dark brownish-red, apex of second joint fuscous, fourth joint pale fuscous ; head triangular, vertex slightly overlapped by pronotum, eyes touching pronotum ; pronotum trapezoidal, transverse, anterior angles rounded ; wing-pads reaching rather less than half-way down body ; upper surface clothed with a scattered, not very long, pale pubescence, which also forms a fringe to lateral margins of pronotum ; tibiae with fine, blackish spines, springing from minute black points ; last two joints of antennae together slightly shorter than second joint. There is no trace of the deciduous white scale-like hairs which distinguish the adult *Psalli.*

Life-cycle. The imago occurs from June to October ; but most of them die away about the beginning of September.

Habitat, etc. With this insect we begin the genus *Psallus*, a large genus of delicate insects which are of arboreal habits. Oshanin's Catalogue contains about seventy Palaearctic species, of which we possess in the British Isles only fifteen. Some of them are extremely variable in coloration, and other species again are very closely allied, differing mainly in such features as the proportionate length of the antennal joints, the presence or absence of a keel to the genital segment, etc., so that for their satisfactory determination it is very desirable to have good specimens. They are entirely summer insects, and very few of them last as long as to October, disappearing entirely during winter and early spring.

The present species occurs on alder, sallow, and apple trees; J. E. Mason gives also oak; Reuter adds hawthorn. In Bohemia it has been found in July on *Picea excelsa* (Nickerl), and similarly in June in the Carpathians (Horváth).

It is found in many places abundantly in apple orchards, but it does not appear to do much, if any, damage, at any rate, not nearly so much as *Plesiocoris rugicollis* and *Orthotylus marginalis.* Two pieces of evidence supplied by Mr. J. C. F. Fryer point to this conclusion. Out of a number of orchards examined, *P. ambiguus* was found plentifully in all whether they showed traces of injury or not; and again, in May, 1915, three small apple branches were enclosed with young *P. ambiguus*, which were left for four days, and though the bugs were observed feeding, no obvious injury was produced. Any damage they may do, therefore, may be regarded as negligible.

Douglas records that a ♀ at the end of June flew into a room to a lighted lamp.

Reuter (12) describes the following varieties:

> (*a*) ♂ totus niger, tantum margine verticis luteo, cuneo basi haud dilutiore; ♀ fusco-nigra, cuneo apiceque embolii picescenti-rufis, verticis margine testaceo; femoribus apice excepto nigris.
>
> (*b*) ♀ fusco-nigra, margine verticis, sutura clavi, cuneo et saepe margine externo corii pedibusque totis rufescenti-testaceis, antennis articulo secundo etiam basi nigricante.
>
> (*c*) ♂ nigro-fuscus, margine verticis testaceo, basi summa cunei dilute fusci vel obscure-testacei sub-pellucida; ♀ fusco-ferruginea, hemelytris dilute fusco-griseis, sub-pellucidis, cuneo pellucido-testaceo, apice dilute infuscato; femoribus magis minusve testaceis.
>
> (*d*) ♂ fere ut praecedens, sed ♀ supra toto rufo-ferruginea, tantum apice capite nigro-signato, corio disco saepe nonnihil infuscato, pedibus rufo-testaceis.

Distribution. *P. ambiguus* is distributed over the whole of Europe. In Britain it is recorded from thirty English counties, i.e. all except Westmorland, Staffs, Salop, Warwick, Rutland, Hunts, Beds, Northants, Monmouth, and Hereford; the Welsh records are from Carnarvon, Brecknock, and Glamorgan, and it is found in both Scotland and Ireland.

400. **Psallus betuleti** Fall.

Fall. Hem. Suec., 97, 41 (1829); D. & S., B.H. 404 (1865) (ambiguus); Saund., H.H.B.I. 311 (1892).

Ova. Unknown.

Larvae. Last instar, 3–3½ mm. Broad oval, with fore parts dark reddish-brown and abdomen red, superficially resembling *Heterocordylus tibialis*, but not so dark; structurally very different; clothed, especially the fore parts, with a long yellowish or whitish pubescence; head triangular, with an ochreous V-shaped mark on the vertex, the apex of which meets a central ochreous line on the pronotum; pronotum trapezoidal with posterior angles widely rounded; wing-pads short, not reaching much beyond base of abdomen; segmental margins of red abdomen ochreous, forming thus a series of transverse bands; legs and antennae together with extreme base and apex of abdomen concolorous with fore parts; scent-glands with a large central, and two lateral linear marks also of the same colour; antennae and tibiae with rather long black hairs; last two joints of antennae together about equal in length to second joint.

Life-cycle. The imago occurs from May to August, though the majority do not mature till the middle of June.

Habitat, etc. This insect is remarkably uniform in its choice of food-plant, being almost confined to the birch (*Betula alba*). It makes its appearance when the leaves of the trees have reached a moderate size and are of medium consistency. There is a small, dark var. of the ♀, which according to Reuter occurs on sallows. Morley (4) has taken the insect on alder and reeds, but the latter of these is no doubt a casual occurrence. Reuter (12) gives alder in addition to birch.

This is the largest known species of the genus *Psallus*, and the larva differs considerably from those of the other species, in being more robust and with stouter antennae and legs; in fact, on seeing the larva alone, one would feel inclined to refer it to a different genus.

Reuter (12) describes three varieties as follows:

> (*a*) ♂ nigro-fuscus, hemelytris nigro-rubiginosis, cuneo fusco-rufo, basi lunula albida, membrana venis flavo-testaceis, areolis fere totis nigricantibus; ♀ obscure sanguinea, capite, verticis linea basali excepta, pronoto basi et apice, macula cuneiformi corii, pectore marginibusque segmentorum ventralium nigris, pedibus sanguineis, membrana ut maris.
>
> (*b*) Minor, pronoto toto nigro-piceo, membrana areolis pellucidis, apice infuscatis, cetero ut in ♀ praecedentis. (♀) (found on *Salix*).
>
> (*c*) ♀ pronoto antennarum articulo secundo, femoribus basi hemelytrisque, basi apiceque cunei exceptis, nigro-piceis, vena brachiali fusca.

Distribution. This insect occurs over Northern and Central Europe, as well as Algeria and Siberia. In Britain it is not so common as the preceding; it is recorded from twenty-four English counties, including the coast counties from Northumberland to Glo'ster, except Lincs and Dorset, together with Cumberland, Westmorland, Lancs, Cheshire, Notts, Leicester, Warwick, Worcester, Surrey, Berks, and Wilts; the Welsh records are from Brecknock and Glamorgan, and it is recorded from both Scotland and Ireland.

401. **Psallus obscurellus** Fall.

Fall. Hem. Suec., 108, 62 (1829); D. & S., B.H. 436 (1865) (pini); Saund., H.H.B.I. 312 (1892).

Ova. Unknown.

Larvae. Last instar, 2¼ mm. Quite unlike the adult; fore parts brownish testaceous or brown, with apex of wing-pads sometimes much darker; abdomen yellow or orange; legs and antennae brownish testaceous; the whole surface with a very short and scattered silky pubescence; head triangular; pronotum transverse, trapezoidal, with angles rounded; body ovate, wing-pads extending about half the distance from pronotum to end of abdomen; legs without spots, except a row of indistinct black ones at rather long intervals, on the outer edge of posterior tibiae; antennal joints in order of length, 2, 3, 4, 1, second joint thicker than the rest. It is thus seen that the black colour which marks the adult is entirely absent from the larva.

Life-cycle. The imago occurs from June to August.

Habitat, etc. This is one of several species of *Psallus* which inhabit coniferous trees. It occurs chiefly on Scotch fir (*Pinus sylvestris*); in W. France it has been found also on *Juniperus communis*. Morley (4) records it also from aspen, which must be merely a casual occurrence. On Scotch fir, it often occurs in company with *Atractotomus magnicornis*, the ♂ of which it much resembles.

Reuter (12) gives the following varieties:

> (*a*) Supra fusca, hemelytris fuliginosis, cuneo basi paullo pallidiore, femoribus sordide testaceis, coxis trochanteribusque pallidioribus.
>
> (*b*) Subtus testacea, supra dilute fuscescens, vel tota testacea.

Distribution. This again is distributed over practically the whole of Europe and in Algeria. In Britain it is recorded from twenty-one English counties, including the coast counties from Lincs to Hants, together with Northumberland, Cumberland, Lancs, Notts, Cambs, Hereford, Glo'ster, Oxon, Bucks, Surrey, Berks, Wilts, Devon, and Somerset. It is found in Scotland, but there are no records from Wales or Ireland.

402. **Psallus variabilis** Fall. and vars. **whitei** and **simillimus** D. & S., B.H. 410 (1865).

Fall. Hem. Suec., i, 98, 43 (1829); D. & S., B.H. 408 (1865); Saund., H.H.B.I. 313 (1892).

Ova. Unknown.

Larvae. "Nympha junior, statura imaginis, tota rufescens, aureopilosula, tibiis tarsisque, apice fusco excepto, pallide luteis, rostro coxas medios attingente, fuscescente. Adultior: ut praecedens, sed capite, dorso thoracis et rudimentis alarum brunnescentibus, his apicem versus obscurioribus, tibiis distincte brunneo-punctatis" (Reuter, 2).

To this it need only be added that the "tota rufescens" applies occasionally to the last instar as well, and that the wing-pads are short, as in the rest of the *Psalli.*

Life-cycle. The imago occurs from June to August, maturing about the middle of the first-named month. It has also been found in October.

Habitat, etc. This species, one of our commonest Heteroptera, occurs chiefly on oak trees, but has been found also on beech, maple, ash, lime, and *Prunus*; Whittaker (1) records it from whitethorn flowers, and Morley (4) from flowers of *Conium maculatum.* Evans has taken it at Hawthornden, Midlothian, on *Mercurialis perennis.* It suffers occasionally from parasitism, for Morley writes as follows: "Upon examining an imago of this Heteropteron, captured here (Ipswich) in an apparently healthy condition yesterday (July 2nd), I noticed a yellowish protuberance on the right side just below the base of the wings. At first I thought the insect had been damaged and the epidermis fractured, but closer scrutiny showed the protuberance to be the head of a larva which occupied the whole interior of the abdomen. It is opaque, soft, fleshy, pale flavous, and 3 mm. in length. It is nearly certainly Dipterous, since the corneous cibary organs, discrete lateral lobes, and distinct segmentation of Hymenopterous larvae are all wanting. Moreover, I am not aware that Hymenopterous parasites have ever been bred from the Heteroptera, though *Allotriae* and *Aphidii* are frequently raised from Aphides, and one or two Chalcids prey upon *Lecanium.*"

Reuter (12) gives the following varieties:

> (*a*) Capite, pronoto, scutelloque nigris, pronoto interdum circa angulos posticos fuscescente, hemelytris totis nigris aut nigro-rubiginosis, basi corii fulvescente (♂), vel nigro-rubiginosis, clavo, parte apicali excepta, basique corii late fulvo- vel lurido-testaceis, embolii apice cuneoque obscure sanguineis vel fusco-rubris; femoribus nigris (♂ ♀).
>
> (*b*) Capite, pronoto, scutelloque rufescenti-nigris vel fuscis, pronoto circa angulos basales saepe paullo dilutioribus, hemelytris pallidis totis vel plaga postica corii magis minusve extensa et antice angustata nigricante notatis, embolio cuneoque sanguineis; femoribus nigris. ♀.

(*c*) Capite rufescenti-nigro, linea basali verticis transversali testacea, pronoto grisescenti-rufo-testaceo, callis, macula media magna basin attingente angulisque posticis rufescenti-nigris; scutello rufo-testaceo, basi macula majore triangulari rufescenti-nigra; hemelytris clavo basique corii fulvescentibus, hoc cetero rufescenti, cuneo saturatius picto, apice clavi, plaga postica corii cuneoque extus nigricantibus; femoribus obscure rubris. ♀.

(*d*) Supra flavescenti-rufescens, colore nonnihil in griseum vergente, capite obscure fuscescente, linea transversali verticis flavo-testacea, callis pronoti postice fusco-nigro-marginatis, scutello saepe macula parva basali corioque plaga postica nigricantibus; femoribus obscure rubris. (*Apocremnus whitei* D. & S.)

(*e*) Supra griseo- vel fusco-rubra, capite pronoto et scutello saepe fuscescentibus vel obscure ochraceis, interdum pronoto antice rufescenti-fusco, cetero nonnihil grisescenti-rubro, hemelytris rubris, corio apicem versus cuneoque obscurius et saturatius rubris, fere coccineis, hoc lunula basali angusta; femoribus obscure rubris. ♀. (*Apocremnus simillimus* D. & S.)

Distribution. *P. variabilis* also has a distribution which extends over the Continent of Europe, Algeria, Turkestan, and Siberia. In Britain it is probably quite generally distributed; it is recorded from twenty-nine English counties, viz. all the coast counties from Northumberland to Glo'ster, and also from Cumberland, Westmorland, Cheshire, Derby, Notts, Leicester, Cambs, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; from three counties in Wales, Carnarvon, Carmarthen, and Glamorgan; and also from both Scotland and Ireland. The var. *whitei* has been recorded only from Scotland, but the var. *simillimus* has occurred in Northumberland, Notts, Warwick, Herts, Essex, Kent, Somerset, and Devon, as well as in Finland.

403. **Psallus quercus** Kb.

Kb. Caps., 93, 130 & 163, 25 (1855); D. & S., B.H. 409 (1865); Saund., H.H.B.I. 313 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to August.

Habitat, etc. This species also is found on oaks, but is far from common.

Reuter (12) gives the following varieties:

(*a*) Capite, pronoto, scutello hemelytrisque obscure rufescenti-fuscis, his basi corii fulvis, embolio apicem versus cuneoque paullo laetius rufescentibus, hoc arcu basali albido, apice summo paullo pallidiore; femoribus posticis vix nigro-punctatis.

(*b*) Ut var. (*a*), sed hemelytris griseo-rufis, embolio apice cuneoque fusco-rufis, hoc arcu basali albido.

(*c*) Supra rufo-testacea, capite, plaga majore postica corii cuneoque extus rufescenti-fuscis ; femoribus posticis punctis nigris sub-seriatis notatis.

Distribution. The area of this insect is comparatively restricted ; outside of Britain Oshanin gives Central and Southern Europe. In Britain it is not common, though recorded from twelve English counties, Cumberland, Cheshire, Notts, Leicester, Warwick, Worcester (doubtful), Glo'ster, Essex, Kent, Surrey, Sussex, and Wilts, and from Scotland, but not from Wales or Ireland.

404. **Psallus lepidus** Fieb. and var. **minor.**

Fieb., W.E.M., ii, 337, 25 (1858) ; D. & S., B.H. 416 (1865) ; Saund., H.H.B.I. 315 (1892).

Ova. Length 1 mm. Pale yellowish-white ; a long narrow, tubular egg, rounded posteriorly, thence nearly straight on one side and convexly rounded on the other, narrowed before the collar, which is nearly as broad as the egg in its widest part, truncated slightly obliquely at anterior end.

Larvae. " Nympha : Pallide virescens, imagini statura similis, aureo-pubescens et parcius nigro-hirsutulus, oculis apiceque rostri coxas medias attingente fuscis, apice femorum, tibiis rudimentisque alarum, his obsoletius, fusco- vel nigro-guttulatis " (Reuter, 2).

To this need only be added that the spots extend also to the pronotum, on which, however, they are much more scattered, that on the wing-pads they are much plainer than would be imagined from the description, that the wing-pads are rather longer than usual, that the tarsi are fuscescent at apex, and that the femora have strong marginal black spots as well as those which are less distinct on the disc. Length, 2¾–3 mm.

Life-cycle. The imago is found from June to August ; the majority mature about the middle of June, but some larvae may still be found in August.

Habitat, etc. This insect is found almost exclusively on ash trees, and it is probable that when taken elsewhere, these are merely casual occurrences ; thus Morley (4) records it from hazel and *Cnicus.*

Reuter (12) gives the following varieties :

(*a*) Capite, pronoto et clavo flavescentibus, capite et pronoto densius transversaliter subseriatim rufo-fusco punctatis, clavo maculis sanguineis oblique seriatim positis ornato, apice latius rufo-nigro, pronoti basi et scutello saepe fuscescentibus, apice hujus nonnihil albicante ; corio plerumque apicem versus obscure rufo-sanguineo, cuneo saepe saturatius sanguineo, basi et apice anguste albo, membrana nigricante, venis sanguineis, areolis hyalinis, apice nigricantibus, macula pone apicem cunei fasciaque media transversali hyalinis signata. ♀.

(*b*) Capite et pronoto flavescentibus, illo fere innotato, hoc densius fuscopunctato, scutello hemelytrisque totis sanguineis, tantum clavo basi anguste apiceque angustissime albis ; fascia membranae transversali minus distincta ; femoribus parcius guttatis. ♀.

(*c*) Supra obscure rufo-sanguineus vel fusco-sanguineus, tota unicolor vel tantum capite flavescente, atomis et punctis capitis et pronoti omnino evanescentibus, cuneo tantum basi anguste albido ; membrana, macula pone cuneum excepta, tota nigricante, areolis etiam totis concoloribus, vena brachiali interdum fusca ; femoribus parcius guttatis. ♂.

Distribution. It is distributed over Europe generally. In Britain it is recorded from twenty-four counties, viz. the coast counties from Northumberland to Devon, except Dorset, together with Cumberland, Cheshire, Notts, Leicester, Hereford, Glo'ster, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts ; the Welsh records are from Brecknock and Glamorgan, and it is found in both Scotland and Ireland. The var. *minor* is recorded from Yorks, Norfolk, Suffolk, Hereford, Glo'ster, Herts, Middlesex, Hants, Wilts, Somerset, Devon, Brecknock, and Scotland.

405. **Psallus alnicola** D. & S.

D. & S., B.H. 414 (1865) (alni) ; Saund., H.H.B.I. 315 (1892).

Ova. Unknown.

Larvae. Reuter (2) gives the following description : "Nympha : pallido- vel albido-virescens, nigropilosula, capite, thorace supra, rudimentis alarum femoribusque nigro- vel fusco-guttulosis, tibiis spinis nigris e punctis nigris nascentibus ; rudimentis hemelytrorum basi saepe extus rufis."

On this I must remark that the description seems to have been taken from immature specimens which had not attained their full colour ; I have found that the larva is deep red in all parts except head and thorax, in which green is more or less mixed with the darker colour, and tibiae and tarsi, together with, in some cases, first two pairs of femora, in which the green preponderates, and that the wing-pads are more or less infuscated at the apex and inner margins.

Life-cycle. The imago has been found in June, August, and September.

Habitat, etc. As the name implies the insect is found chiefly on alders, but it has been taken on sallows as well. It can generally be distinguished from the closely allied *P. fallenii*, not merely by the difference in the food-plants, but by its darker and rather duller colour.

Distribution. Either this insect has been much overlooked, or it has a very narrow area ; outside of Britain it is recorded, according to Reuter, only from Finland and Sweden, and to these Oshanin adds Austria. In Britain it is recorded from seventeen English counties, viz. Cumberland, Yorks, Notts, Leicester, Norfolk, Suffolk, Cambs, Herts, Hereford, Glo'ster, Kent, Surrey, Sussex, Hants, Wilts, Somerset, and Devon; the records from Wales are from Carmarthen and Glamorgan, and it is found in both Scotland and Ireland.

406. **Psallus fallenii** Reut. (=P. roseus Fabr. Reut. Hem. Gym. Eur.).

Reut., H.G.E., iii, 462 & 522 (1883); D. & S., B.H. 415 (1865) (salicis); Saund., H.H.B.I. 314 (1892).

Ova. Unknown.

Larvae. "Nympha: Virescens, nigropilosulus et aureo-pubescens, abdomine glabro, capite, thorace, rudimentis alarum pedibusque nigropunctatis, rudimentis alarum basi rufis, capite pronotoque dilute brunneo-ferrugineis" (Reuter, 2).

The specimen described was evidently somewhat imperfect, for the abdomen, so far from being glabrous, is clothed with the same pubescence as the rest of the body. Apart from the colour, the larva closely resembles that of *P. lepidus*.

Life-cycle. The imago occurs from June to September, but larvae may still be found at the beginning of August.

Habitat, etc. In this country this species is, I believe, almost always found on birch. Carr adds aspen; Reuter gives sallow also; but as the species has repeatedly been confused with others, and the synonymy is most involved, it would appear that there has been also some confusion as to the food-plant. Dalla Torre gives also *Lonicera xylosteum*, but it seems probable that this is but a casual occurrence. Reuter also gives doubtfully maple.

Reuter (12) mentions the following varieties:

> (*a*) Capite, pronoto antice, clavo, apice nigro-fusco excepto, corioque basi pallide flavo-testaceis, clavo maculis nonnullis rufis, corio apicem versus plerumque plaga nigricante.
>
> (*b*) Capite, pronoto, scutello hemelytrisque rufo-ferrugineis fere unicoloribus, his sutura fusca, cuneo et basi et apice anguste albo.
>
> (*c*) Ut var. (*a*), sed hemelytris basi cunei excepta unicoloribus rufo-ferrugineis, capite punctis nigris biseriatis, pronoto punctis sparsis laterum, serie transversali disci media et plerumque alia marginis basalis punctorum nigrorum notato; scutello interdum medio vitta albida.

Distribution. This species occurs over Europe generally. In Britain it is recorded from twenty-six English counties, viz. all the coast counties from Northumberland to Cornwall, and from Cumberland, Lancs, Notts, Leicester, Cambs, Warwick, Hereford, Glo'ster, Monmouth, Oxon, Herts, Middlesex, Surrey, and Wilts ; the only Welsh records are from Carnarvon and Glamorgan ; it is found in both Scotland and Ireland.

406*a*. **Psallus luridus** Reut.

Reut. Hem. Gymn. Eur. 133 (1884), E.M.M., lix.

Easily recognised by its almost uniform lurido-testaceous colour and its large head ; a dark spot towards apex of corium ; cuneus white above and below ; smoky membrane with a hyaline dash below cuneus ; legs with black hairs springing from black spots on tibiae ; hind femora reddish at apex, with black spots ; antennae concolorous with body. There is a mixed black and white pilosity. Length, 4–4½ mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found from July to September.

Habitat, etc. It inhabits young larches.

Reuter describes the following varieties :

(*a*) Vertice pronotoque atomis fuscis parce adspersis.
(*b*) Signaturis hemelytrorum obsoletis, vix fusco-pilosus.

Distribution. It is found in the Tyrol and Hungary, and there is a doubtful record from France. In Britain it has occurred in two counties ; Mr. J. Edwards has taken some specimens at Colesborne, Gloucestershire, and I have a specimen taken near Rickmansworth, Herts. Our British specimens belong to var. (*a*).

407. **Psallus varians** H.S.

H.S. Wanz., vi, 45, fig. 603 (1841) ; D. & S., B.H. 418 (1865) ; Saund., H.H.B.I. 316 (1892).

Ova. Unknown.

Larvae. " Nympha : Parce aureo-pubescens, flavescens, unicolor, macula baseos abdominis media rubra " (Reuter, 2).

The red spot at the base of the abdomen is of very frequent occurrence in the *Capsidae*, and cannot be regarded as a specific feature. In all the specimens of larvae I have, 2¾–3 mm., the colour is rather reddish ochraceous, with the abdomen often entirely red, or red with yellowish margins to the segments ; the more or less blackish contents of the abdomen show through, making a central indefinite black patch ; there are a few dark spots on the wing-pads, but they are not very distinct ; the spots of the posterior femora are most distinct at the margins, the blackish hairs of the tibiae spring from not very large black spots, and the tarsi are fuscescent at the apex ; tibiae ochreous, antennae rather dirty ochreous, with the third and fourth joints together about the same length as the second. The larva is something like that of *P. lepidus*, but is redder and less spotted, and destitute of black hairs.

Life-cycle. The imago is found from June to September, maturing about the middle of the former month.

Habitat, etc. This species frequents several trees, but most commonly oak. The others, according to Reuter (12), are alder, maple, beech, *Salix*. Morley (4) adds poplar, aspen, and birch, and Carr, *Rhamnus frangula*. It also occurs on flowers and on brambles (Parfitt). Evans has taken it at Hawthornden, Midlothian, on *Mercurialis perennis*; Norman found it in Scotland on *Pinus sylvestris*.

It is a most variable insect both as regards size and coloration.

Reuter thus describes the chief varieties:

> (*a*) *nigrescens* Fieb. Fusco-testacea vel fusca, hemelytris fuliginosis, basi saepe pallidioribus, corio summo margine apicali extus cuneoque basi laetius apiceque anguste albidis vel pallidis. ♂.
>
> (*b*) Fusco-testacea, corio margine externo postice cuneoque apicem versus aurantiaco-rubris, cetero ut in praecedente. ♂♀.
>
> (*c*) *insignis* Fieb. Flavo-testacea, corio postice vel ad maximam partem cuneoque apicem versus aurantiaco-rufis, cetero ut in var. (*a*). ♂♀.
>
> (*d*) *decoloratus* M. & R. Albicans, lineis frontalibus transversis, pronoti lateribus basique scutelli dilutissime rufescentibus; corio plaga magna obliqua elongata-triangulari fusco-rufa, cuneo toto albido; membrana dilute fumata, venis albidis, apice areolae majoris minoreque tota fuscis, macula ad apicem cunei hyalina majore, postice latius fusco-terminata, macula discoidali magna albido-hyalinescente.
>
> (*e*) *ochraceus* Fieb. Supra tota ochracea, unicolor, tantum corii margine apicali cuneoque basi et apice albidis. Saepe praecedentibus minor. ♂♀.

Distribution. *P. varians* is distributed over the greater part of Europe. In Britain it is very widely spread, being recorded from thirty-two English counties, i.e. all except Staffs, Salop, Rutland, Hunts, Beds, Worcester, Hereford, and Monmouth; the Welsh records are from Carnarvon and Glamorgan, and it is found in both Scotland and Ireland.

408. **Psallus diminutus** Kb.

Kbm. Rhyn. Wiesb., 170, 28 (1855); Saund., H.H.B.I. 316 (1892).

Ova. Unknown.

Larvae. "Nympha: Imaginis statura, pallide flavescens, aureo-pubescens, et nigro-pilosula, oculis, apice rostri coxas posticas attingentis apiceque tarsorum nigris; tibiis rudimentisque alarum, his obsolete, nigro-punctatis" (Reuter, 2).

Life-cycle. The imago is found from June to August.

Habitat, etc. It is found on oaks in company with the preceding species, but can generally be recognised by its smaller size.

Reuter (12) gives the following varieties :

(*a*) Clavo medio fasciaque vel plaga apicali corii nigricantibus.

(*b*) Hemelytris et scutello fere totis rubris, apice scutelli et lunula basali apiceque cunei albis ; pronoti colore in rubrum vergente.

Distribution. It occurs throughout Europe and in Algeria. In Britain, it has hitherto been recognised in fourteen English counties, viz. Westmorland, Yorks, Notts, Norfolk, Suffolk, Glo'ster, Herts, Middlesex, Essex, Surrey, Sussex, Hants, Wilts, and Devon ; the only Welsh record is from Glamorgan ; but it has been found in both Scotland and Ireland.

409. **Psallus albicinctus** Kb.

Kbm. Rhyn. Wiesb., 172, 29 (1855) ; Saund., H.H.B.I. 316 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago has been found in July.

Habitat, etc. It occurs on oak, beech, and sallow.

Reuter (12) gives the following varieties :

(*a*) Pronoto lateribus, scutello hemelytrisque praesertim apicem versus rubedine laete tinctis.

(*b*) Pallidius testacea, corio apicem versus cuneoque aurantiacis.

Only the dark var. has been found with us.

Distribution. It occurs in Central Europe. In Britain only a single specimen has been recorded, a ♀ taken at Chobham, Surrey, in July, 1892.

410. **Psallus roseus** Fabr. (=P. sanguineus Fabr. =P. alni Fabr. Reut. H.G.E.).

Fab., S.R. 238, 178 (1776) ; D. & S., B.H. 412 (1865) (querceti) ; Saund., H.H.B.I. 317 (1892) (sanguineus).

Ova. Unknown.

Larvae. " Nympha : Virescenti-alba, longius pallido-pilosa et pubescens, pilis nigris intermixtis, femoribus atomis praesertim in margine majoribus nigris ; tibiis nigro-punctatis, spinis albis ; dorso abdominis basi pallide ochraceo " (Reuter, 2).

Life-cycle. The imago occurs from June to September.

Habitat, etc. It occurs on sallows, including *S. repens*, on which I have found it abundantly on the sandhills at Kidwelly, Carmarthenshire. Carr gives *Corylus* in addition ; Reuter gives also *Alnus* and *Quercus*.

Reuter (12) gives the following varieties of this exceedingly variable species :

(*a*) Supra ad cuneum usque rosea, unicolor, vel pronoto scutelloque albido-conspersis, hoc apice albido. (*sanguineus* Fabr.)

(*b*) Supra ad cuneum usque rufo-testacea, unicolor vel corio plaga nigricante.

(*c*) Cinerascenti-flavescens, pronoto, scutello, clavo et corio sat dense rubro-maculatis.

(*d*) Supra albida, ad cuneum usque dense rubro-irrorata.

(*e*) Supra albida, ubique ad cuneum usque parcius rubro-irrorata, interdum corio plaga postica rubra vel nigricante. (*alni* Fabr., *querceti* Fall.)

(*f*) Supra tota albicans, interdum plaga postica corii nigricanti.

It can usually be recognised by its white cuneus.

Distribution. It is distributed over the whole of Europe, and in Tunisia and Siberia. In Britain it is a very abundant species, and is recorded from twenty-nine English counties, viz. all the coast counties from Northumberland to Glo'ster, together with Cumberland, Lancs, Cheshire, Derby, Notts, Hereford, Monmouth, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

411. **Psallus vitellinus** Scholtz.

Scholtz. Arb. und. Verh., 26, 40 (1846); E.M.M., xlviii, 60.

As this is an addition subsequent to the publication of Saunders' "Hemiptera-Heteroptera of the British Islands," a description is appended:

"Uniformly flavo- or rufo-testaceous, and covered with a pale yellowish pubescence which is easily abraded; membrane slightly dusky, with a minute pale spot just below the apex of the cuneus; cell-nerves concolorous with the hemielytra, the colour spreading from them as an irregular border; legs and antennae concolorous with the hemielytra, the antennae with indications of two blackish rings on the basal joint, and sometimes with the base of the second joint black. Femora with a few blackish-brown spots, tibiae with black spines springing from black spots, and with the extreme base black. Length $2\frac{2}{3}$ mm.

"In its uniform coloration, and the markings on the antennae and tibiae, this little insect resembles a *Plagiognathus*, but from that genus it differs in the absence of strong black hairs on the hemielytra, and in the greater length of the terminal joint of the posterior tarsi, which is much longer than the second; the eyes also are granulate instead of smooth. From our other British *Psalli* it may be easily distinguished by its uniform colour and its small size, and by being the only species which has the base of the tibiae black" (Butler, 30).

Ova and **Larvae.** Unknown.

Life-cycle. The insect matures in June and has occurred from that month to August.

Habitat, etc. It occurs on coniferous trees, and I have taken it on spruce firs in two localities, Burnham Beeches, and Lee Common on the Chiltern Hills, Bucks. Of the original specimens taken at Colesborne, Gloucestershire, Mr. Jas. Edwards, their captor, writes: "If the species really lives exclusively on conifers, it must have been introduced to the Colesborne station with young trees, and equally certainly must have lived in this country for at least ten years. I could not decide whether my specimens came from young conifers, young hard-woods, or the rough herbage round." Reuter (12) gives *Pinus sylvestris*, *Abies excelsa*, *A. pectinata*, *Larix europaea*, *L. sibirica*.

Reuter (12) describes a var. thus:

"Antennarum articulo primo tantum punctis duobus geminatis in medio positis articuloque secundo annulo angusto mox ante basin fuscis."

Distribution. It has occurred in Central and Southern Europe, Algeria, and Siberia. In Britain the first specimens were taken by Mr. Jas. Edwards in a plantation at Colesborne, Cheltenham, July 26th, 1911; I have since taken it, as above, in Bucks, Mr. H. Britten in Oxon, and Mr. T. Edmonds in Somerset.

412. **Psallus salicellus** Mey.

Mey. Caps., 74, 47 (1843). D. & S., B.H. 411 (1865); Saund., H.H.B.I. 317 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from July to October. It is rather later than the rest of the *Psalli*, most of the larvae not maturing till August.

Habitat, etc. It lives mainly on *Corylus* and *Salix*, especially the former. But it has been found also on birch and alder (Morley, 4).

Distribution. It is found chiefly in Central and Southern Europe. In Britain it is recorded from twenty-three English counties, viz. all the coast counties from Yorks to Glo'ster, together with Notts, Leicester, Hereford, Oxon, Bucks, Herts, Middlesex, Surrey, Berks, and Wilts; the Welsh records are from Carmarthen and Glamorgan; but it has not been found in either Scotland or Ireland. Hence its northernmost limit is the north-east of Yorkshire.

With this species we close the long list of *Psalli*. It is to be hoped that students will pay great attention to these delicate insects, and will try to secure perfect specimens, and a good store of them, for complete examination (upper and under sides), as well as for dissection.

413. **Atractotomus mali** Mey.

Mey. Rh. Schw., i, 63, 30 (1843); D. & S., B.H. 435 (1865) (magnicornis); Saund. H.H.B.I. 309 (1892).

Ova. Unknown.

Larvae. An intermediate stage found in Epping Forest, June 15th, 1912. Length $1\frac{3}{4}$ mm. Oval; fore parts chocolate-brown, more or less tinged with red; dorsum of abdomen bright red, legs brown, apical half of tibiae whitish, tarsi infuscated, paler in the middle; antennae with two basal joints concolorous with head, first joint stout, second incrassated and covered with black hairs, last two joints slender, yellow; a few white setae on the dorsal surface ; rostrum long, more or less infuscated ; wing-pads distinct but small.

The preceding instar, 1¼ mm., whole body more or less crimson, a little tinged with brown ; femora and first two antennal joints concolorous with body ; tibiae and tarsi and last two antennal joints whitish flavous, base of tibiae more or less reddish-brown ; no trace of wing-pads ; mesonotum longer and broader than pronotum, centrally with a fine groove ; the dorsal surface with a rather long pale pubescence.

Life-cycle. The imago appears towards the end of June and lasts through July and August. It seems probable that the eggs are laid in the summer, but do not hatch till the spring of the following year, when the young larvae would appear some time in May.

Habitat, etc. It is found on hawthorn, and on fruit trees in gardens, as well as apple trees in orchards. With regard to the latter, it does not appear to do much damage (see "Capsid Bugs," J. C. F. Fryer). On the contrary, in "Bull. Soc. Ent. Fr." (1900), Alfred Giard ascribes to this species attacks on the larvae of some of the "Small Ermine" moths of the genus *Hyponomeuta*, which had been previously ascribed by Dr. Pommerol to a *Reduviid.* The caterpillars in question were those of *H. malinellus* and *H. padellus*, which were inflicting damage on apple trees. The Capsids, by feeding upon them, reduced their numbers and so proved themselves useful to the horticulturist. Lethierry also describes a similar habit, an attack on the larvae of *H. padellus*, which were feeding on *Crataegus.* Reuter states that it is found also on *Prunus.*

Distribution. It is distributed over Northern and Central Europe, and South Russia. In Britain it has been recorded from eighteen English counties, viz. the coast counties from Norfolk to Kent, together with Staffs, Notts, Leicester, Cambs, Northants, Worcester, Oxon, Bucks, Herts, Middlesex, Surrey, Hants, Devon, and Somerset. There are no records from either Wales, Scotland, or Ireland. The northernmost limit is therefore in Staffordshire and Nottinghamshire.

414. **Atractotomus magnicornis** Fall.

Fall. Mon. Cim., 99, 7 (1807) ; Saund., H.H.B.I. 310 (1892).

Ova. Unknown.

Larvae. "Nympha : griseo-rufescens vel ferruginea, longe nigro-pilosa ; antennis articulis duobus ultimis pedibusque grisescentibus vel albido-ferrugineis, tibiis nigro-punctatis et spinulosis ; capite, pronoto rudimentisque alarum griseis vel ferrugineis, his aureo-pubescentibus, apice plerumque obscuris ; dorso abdominis medio atomis in lineis 4 vel 6 positis rufofuscis ; apice tarsorum nigro ; oculis ferrugineis " (Reuter, 2).

Appended is a description of a larva taken at Burnham Beeches, June 22nd, 1912. Length 2⅓ mm. Head, thorax and wing-pads purplish-grey, covered with a delicate bloom; abdomen pink, with a broad purplish streak on each side; the whole with long black hairs and finer white ones intermixed; pronotum transverse; legs greyish-yellow, posterior femora with two black spots near the apex, intermediate with one, tibiae with long black hairs springing from black spots, and a general pubescence of fine black hairs, tarsi infuscated at base and apex; antennae with basal joint reddish, second incrassated, fusiform, deep reddish-purplish, two terminal joints slender, pale yellow, first joint with a few black setae, second thickly set with stout black hairs, last two with very fine dark hairs.

Life-cycle. The imago occurs from the end of June to September.

Habitat, etc. It lives exclusively on coniferous trees, especially Scotch and spruce firs. I have also found it on larch. Reuter adds also *Abies alba* (Carpathians, Horváth).

Distribution. It occurs throughout Northern and Central Europe. In Britain it has been recorded from twenty-one English counties, viz. Cumberland, Yorks, Derby, Notts, Lincs, Norfolk, Suffolk, Cambs, Hereford, Oxon, Bucks, Herts, Middlesex, Kent, Surrey, Sussex, Berks, Dorset, Wilts, Devon, and Somerset. The Welsh records are from Carnarvon, Carmarthen, and Glamorgan. There are none from either Scotland or Ireland. A considerable number of Palaearctic species have been described under this genus, some others of which, in addition to these two, may possibly be found with us.

415. **Plagiognathus albipennis** Fall.

Fall., Hem. Suec., 107, 59 (1829); Saund., H.H.B.I. 319 (1892).

Ova. Unknown.

Larvae. "Nympha virescens" (Reuter).

Life-cycle. The imago occurs from July to September.

Habitat, etc. The food-plants are *Artemisia absinthium* and *A. abrotanum*, and also *A. arborea* in gardens; on these plants it is often abundant. Its silvery pubescence is in perfect keeping with the silvery appearance of the plants.

Reuter describes the following varieties:

(*a*) Niger vel nigricans, vertice utrinque macula lutea; sutura clavi cuneoque basi albis, membrana nigricante, areolis totis infuscatis; scutello basi utrinque puncto luteo; antennis femoribusque nigris, illis articulo secundo ipso apice articulisque ultimis fuscescentibus, his summo apice pallidiore. ♂♀.

(*b*) Ut praecedens, nigricans, sed basi et saepe etiam margine externo corii basique cunei albidis. ♀.

(*c*) Supra fuscescens; ut var. (*b*), sed etiam basi clavi albida; cuneo albido, apice nigro. ♂.

(*d*) Albicanti-fuscescens, capite fuscescenti-testaceo, apicem versus

obscuriore, vertice ad oculos utrinque albido; pronoto grisescente, callis ochraceo-testaceis, lateribus fuscescente; scutello fuscescente, medio vage pallido, angulis basalibus testaceis; hemelytris grisescenti-albidis, clavo dimidio apicali, corio apicem versus cuneoque fuscis, hoc basi late albido; membrana dilute infumata, areolis tantum apice fuscescentibus, cetero pellucidis; antennis nigris, articulo secundo dimidio apicali duobusque ultimis obscurius testaceis; femoribus anticis pallido-testaceis, posticis fuscescentibus.

(*e*) Subtus fuscescens, vel nigricans, supra sordide vel grisescenti-albida, densius albo-pubescens; clypeo nigro, pronoto antice scutelloque nigrofuscis, his angulis basalibus aurantiaco-fuscis; clavo apice cuneoque fuscescenti-griseis, margine corii flavescente; antennis pallide testaceis; articulo primo dimidioque basali articuli secundi nigris; pedibus sordide albido-testaceis, femoribus supra ad apicem puncto nigro setifero, his posticis fuscescentibus, tibiis et tarsis ut in forma typica signatis, sed tibiarum apice et tarsis saepe totis fuscis (*Agalliastes lanuginosus* Jak).

(*f*) Subtus fuscescens, vel nigricans, supra sordide vel grisescenti-albida, densius albo-pubescens; capite sub-ochraceo, loris, genis, clypeoque fuscis; scutello saepe fuscescente; cuneo fuscescenti-testaceo, basi albido; membrana leviter obscurata, areolis totis hyalinis vel areola majore fuscescente; antennis et pedibus ut in var. (*e*), ♀ (*Agalliastes tibialis* Fieb).

(*g*) Ut praecedens, antennis autem albidis, tantum articulo primo nigro.

Distribution. *P. albipennis* is found over the whole of the Palaearctic Region. In Britain it is local, having been recorded from fourteen English counties, almost entirely on the coast, viz. Cumberland, Durham, Yorks, Notts, Norfolk, Suffolk, Essex, Kent, Surrey, Sussex, Dorset, Devon, Cornwall, and Glo'ster (in a garden); the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, but there are none from either Scotland or Ireland.

416. **Plagiognathus chrysanthemi** Wolff. (P. viridulus Fall. Reut.).

Wolff. Wanz., 151 (1834); D. & S., B.H. 401 (1865) (viridulus); Saund., H.H.B.I. 320 (1892) (viridulus).

Ova. Unknown.

Larvae. "Nympha (adultior): Virescens, statura imaginis, supra breviter nigro-pilosula, oculis, articulo primo antennarum intus guttulis duabus, articulis reliquis basi summa (♀) vel articulo primo apice excepto secundoque basi late nigris (♂); apice rostri coxas posticas attingentis, punctis femorum nonnullis marginalibus, genubus, punctis plurimis tibiarum tarsisque basi et apice nigris, tibiis nigro-spinulosis; margine

pronoti postico rudimentisque alarum interdum flavescentibus (♀ ?)" (Reuter, 2).

Appended is a description of a larva taken at Epping Forest, June 15th, 1912. Green, with black hairs, tibiae with black spots, outwardly giving rise to black hairs, the spots indistinct on fore pair, more distinct on intermediate, and very prominent on posterior, tibiae dark at base also; apex of posterior femora with two large black spots inwardly and one outwardly, intermediate with two inwardly only, tarsi fuscous; antennae, basal joint with basal and apical dark rings, basal the plainer, second joint dark at base, rest of antennae more or less infuscated.

An earlier instar taken at Box Hill, June, 1917; delicate pale green, sparsely clad with blackish hairs; a black spot at base of tibiae, and hairs on hind tibiae springing from strong black spots; tarsi infuscated at apex; other black spots as before. These black markings will always suffice for the recognition of this species, even when the green colour has faded.

Life-cycle. The imago occurs from June to October, maturing in the last half of the first-mentioned month.

Habitat, etc. Notwithstanding its specific name, this insect does not appear to be attached to any particular species of plant, but occurs almost everywhere by sweeping low herbage. Morley (4) mentions *Verbascum*, *Vicia sativa*, *Spiraea ulmaria*, and this list could certainly be greatly extended.

It is not so gregarious as most of the *Capsidae*, but, on the other hand, is far more generally distributed, so that, while there are not so many specimens in a limited area as often occur for other species, the wider distribution is a counterbalancing factor, and the total number of specimens in existence at a given time is probably far in excess of what obtains with other species which at first sight seem to be much more abundant. Not only is it taken by sweeping, which indicates occurrence on the upper parts of the herbage, but it occurs commonly also at the roots of low plants. The black hairs are very easily abraded, so that really good specimens are not easy to obtain. The species, to judge from the large numbers that have been sent me for determination, puzzles beginners very much, but it can usually be recognised by the black markings of the basal joint of the antennae, and the minute black spots at the knees, especially the hind pair, these features being of course taken in conjunction with the other characteristics.

It is very commonly the prey of certain Fossorial Hymenoptera.

Reuter (12) describes the following varieties:

(*a*) Supra pallide virescens vel virescenti-flavescens, tantum apice clypei nigro. ♂ ♀.

(*b*) Sordide dilute fuscescenti-virescens vel -testaceus, fronte plagis duabus fuscescentibus, clypeo ipso margine basali apiceque nigro, apice embolii, corio angulo postico interiore cuneoque fuscescentibus ; scutelli angulis basalibus saepe sub-ochraceis. ♂.

(*c*) Obscurius fusco-virescens vel virescenti-fusca, capite fere toto infuscato, vertice postice latius testaceo, macula inter callos pronoti nigricante, scutello linea media nigricante vel toto fusco, angulis basalibus sub-ochraceis. ♂.

Distribution. *P. chrysanthemi* occurs over the whole of Europe and in Algeria, Turkestan, and Siberia. In Britain it is one of our most universally distributed species, being included in almost all published lists ; it is recorded from thirty-three English counties, the only omissions being Staffs, Salop, Rutland, Hunts, Beds, Worcester, and Monmouth ; the Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

417. Plagiognathus arbustorum Fabr.

Fab., E.S. iv, 175, 141 (1794) ; D. & S., B.H. 402 (1865) ; Saund., H.H.B.I. 320 (1892).

Ova. Unknown.

Larvae. " Nympha (adulta) : Viridis, nigro-pilosa, antennis pedibusque pallidis, illis articulo primo, apice excepto, secundo ultra medium, tertioque fere triente basali nigris, articulo tertio secundo paullo breviore, his femoribus apicem versus marginibus, tibiis basi punctisque magnis et dense positis nec non tarsisque totis nigerrimis ; metanoto apice anguste pallescente ; rudimentis alarum saepe apicem versus nigricantibus " (Reuter, 2).

On June 14th, 1913, I took in Epping Forest a small green Capsid larva, which I brought home inadvertently with a larva of a large Capsid. I was fortunate in rearing it by feeding it upon ordinary lawn grass, mainly, no doubt, *Poa annua*, and it turned out to be the present species. It moulted on June 23rd, and then appeared green with whitish legs, each with a black streak on the upper and lower margins of the femora, black base to tibiae, and black spots on same ; antennae whitish with basal joint black at apex, second black at base and apex, the former broadly ; body with a few yellow spots and with black hairs. It made a further ecdysis on June 28th, when its appearance was as before, but with the beginning of the wing-pads. The next ecdysis occurred on July 4th, and the insect was as before but with wing-pads larger and margined with yellowish. The final change to the imago was made on July 23rd.

The larva can always be recognised by the black lines on the margins of the posterior femora.

Life-cycle. The imago has occurred from June to October, though very few specimens can be found so early as June. The example referred to above shows four larval instars, but the insect was probably in its second instar to begin with. The chief peculiarity is the shortness of duration of the two intermediate instars, especially when compared with the other two ;

thus the first of these lasted at least 9 days, the second 5, the third 6, and the last 19, yielding a total of about 5½ weeks. Too much importance must not, however, be attached to these dates, as the food was inappropriate, and the last instar was probably unduly prolonged in consequence. It is in this last instar that preparation has to be made for the most radical changes which take place at the last ecdysis, and for which, no doubt, there is required abundant nutrition, combined probably with greater freedom of locomotion than could be obtained in the small tube in which, for purposes of observation, it was kept. In this species, as in most of the smaller *Capsidae*, the active life seems to be restricted to five months, and that seems to imply oviposition in the autumn and the hatching of the eggs towards the end of the following spring, so that in such case, the insect must spend more than half the year as an egg.

Habitat, etc. It lives chiefly and most abundantly on nettles, but also occurs on many other plants, such as *Spiraea ulmaria*, *Peucedanum*, *Pastinaca*, *Senecio*, *Lappa*, and *Umbelliferae*. Evans has taken it even on the red poppy (*Papaver rheas*). The specific name which Fabricius gave it is most inappropriate, as it has no connexion at all with trees or shrubs.

This is probably our commonest Capsid, and from its vast numbers one would conclude that it has but few enemies, though curiously enough it is one of the very few *Capsidae* of which capture by another insect has been recorded. Donisthorpe found a young larva of *Nabis lativentris* sucking a *P. arbustorum* which was far larger than itself. It is, however, though normally a vegetarian, quite ready, on occasion, to turn carnivore itself, and has been observed by Morley sucking immature rose-Aphides (*Siphonophora rosae* L.).

It is also extremely variable, but there does not appear to be any definite association of the varieties with special plants.

Reuter describes five varieties as follows :

(*a*) Subtus nigra, supra obscure ochracea, cuneo sordide aurantiaco, capite nigro (*Capsus brunnipennis* Mey.).

(*b*) Subtus nigra, capite fusco, pronoto, scutello hemelytrisque pallido-olivaceis.

(*c*) Ut var. (*a*), sed pronoto antico scutelloque nigro.

(*d*) Supra nigro-fusca, margine postico verticis, angulis basalibus scutelli cuneoque aurantiacis, hujus margine externo et angulo interno basali nigro-fuscis.

(*e*) Supra tota nigro-olivacea, tantum margine verticis pallido.

Distribution. It occurs throughout the whole of the Palaearctic Region. In Britain it is everywhere abundant, and has been recorded in all published lists, viz. for thirty-four English counties (the only counties for which there are no records being Salop, Staffs, Beds, Northants, Worcester, and

Monmouth); the Welsh records are from Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

418. **Chlamydatus pullus** Reut. (Plagiognathus pulicarius Br. Cat.).

Reut. Not. Sk., F.F.F. Förh., xi, 224 (1870); D. & S., B.H. 427 (1865) (pulicarius); Saund., H.H.B.I. 321 (1892) (pulicarius).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from June to September.

Habitat, etc. This insect lives on the ground in dry sandy places at the roots of plants. I have taken it under *Ononis* on the north coast of Norfolk. Morley (4) records it as common in dry fields and coast sandhills, on broom and in rabbit holes. Douglas and Scott give " by sweeping amongst dwarf sallows, etc., also under *Erodium cicutarium.*" It is said by Reuter to occur amongst *Empetrum* (Crowberry) and *Hieracium.* It has a slight saltatory power, although from the nature of its habitat there does not seem to be much opportunity of exercising it.

This insect was formerly considered a var. of *C. pulicarius*, but is now generally regarded as a distinct species. It is smaller than *C. pulicarius* (*pulicarius* $2\frac{1}{2}$–$2\frac{3}{4}$ mm., *pullus* $1\frac{2}{3}$–$2\frac{1}{2}$ mm.), with darker femora, the second antennal joint of the ♂ a little thicker, and a less shining surface. All our British specimens seem to belong to *C. pullus* rather than *C. pulicarius*, although they vary somewhat in size, but none that I have seen exceed $2\frac{1}{2}$ mm. and most are considerably less. One of my specimens has the femora intermediate in colour between the two speices, those of *C. pulicarius* being flavous, only slightly darkened, and showing distinct spots. Reuter mentions two forms, a brachypterous, in which the membrane passes only slightly beyond the abdomen, and a macropterous, in which it passes much beyond, and has its external margin longer than that of the cuneus. Most of our specimens are of the brachypterous form.

Reuter mentions the following variety: " Hemelytris fuscis, pubescentia pallide flavescente; pedibus flavo-ferrugineis, femoribus posticis punctis paucis marginalibus fusco-nigris. Long. $1\frac{2}{3}$–$2\frac{1}{2}$ mm."

Distribution. *C. pullus* is distributed throughout Europe, and in Algeria, Turkestan, Siberia, and Northern Mongolia. It reaches the northern limit of 69°. In Britain it has been recorded from thirteen English counties, viz. Northumberland, Lancs, Cheshire, Notts, Norfolk, Suffolk, Kent, Surrey, Sussex, Berks, Wilts, Somerset, and Devon. Probably it has been overlooked elsewhere as it lives so much in concealment. The Welsh records are from Merioneth, Carmarthen, and Glamorgan, and it is recorded from Scotland, but not from Ireland.

419. **Chlamydatus saltitans** Fall. (Plagiognathus id. Br. Cat.).

Fall. Mon. Cim., 96, 80 (1807); D. & S., B.H. 428 (1865); Saund., H.H.B.I. 322 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago is found from June to September.

Habitat, etc. Like the preceding, this insect occurs in dry, sandy places, at the roots of plants; Douglas found it amongst tall heather on sandhills in Scotland; Morley (4) says, "beneath stones and among *Ornithopus perpusillus*," and J. Edwards, "amongst short grass." It has considerable saltatory power, and is almost always brachypterous in both sexes, though the macropterous forms of both occasionally occur.

Reuter gives the following varieties:

> (*a*) Aeneo-nigra, vertice margine postico ferrugineo, hemelytris basi pallide testaceis, in *forma macroptera* etiam basi cunei magis minusve anguste pallido.
>
> (*b*) Brunnescens, antennis basi, capite postice, hemelytris basi et apice inaequaliter late pallido ferrugineis.
>
> (*c*) Pallide ferruginea, capite, vertice excepto, antennis, callis angulisque posticis pronoti, angulis basalibus scutelli, vitta lata clavi signaturaque magna biangulata corii, corpore femoribusque, apice excepto, nigricantibus. ♀ (from a drawing of Fieber's).

Distribution. It occurs throughout Europe and in Siberia. In Britain it is recorded from twelve English counties, viz. Northumberland, Leicester, Norfolk, Suffolk, Glo'ster, Monmouth, Middlesex, Kent, Surrey, Sussex, Hants, and Devon. The Welsh records are from Carnarvon and Carmarthen, and it is recorded from Scotland, but not from Ireland.

420. **Chlamydatus wilkinsoni** D. & S. (Plagiognathus id. Br. Cat.).

D. & S., E.M.M. 1866; Saund., H.H.B.I. 322 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs from May to August.

Habitat, etc. This insect also is dimorphous in both sexes, but the macropterous forms are very rare. It was described for the first time in 1866 and named in honour of its discoverer, who found it at Scarborough, at the roots of *Convallaria majalis*, the lily of the valley. Buchanan White says of it: "It was supposed to be attached to this plant, which is rare in a native state in Britain, but it seems to have no particular connexion with it or any allied plant. . . . Sandy dry ground, covered with very short grass, thyme and other plants seems the especial haunt of the species. . . . It is somewhat difficult to catch, from its active leaping habits, but by sweeping with a net a series may be easily obtained." I have taken it in moss growing amongst grass on the sides of Snowdon in August. Norman found macropterous specimens amongst short grass in woods. Reuter mentions the following variety: "Picea, femoribus fusco-testaceis, cetero ut forma typica."

Distribution. Outside the British Isles, this species has been recorded from France (doubtfully), Norway, Lapland (both Swedish and Russian), and Western Siberia. In Britain, so far as England is concerned, it has occurred only in Cumberland, Yorks, Devon, and Glo'ster; there are two Welsh localities; for I have taken it, as above, in Carnarvonshire, and I have specimens taken by the late W. E. Sharp at Barmouth, Merionethshire, at a height of 2000 feet. In Scotland it is, according to Buchanan White, "widely distributed, but local"; he took it in June in the counties of Inverness, Aberdeen, and Kirkcudbright. At Braemar he found it at a height of 1100 feet.

421. **Chlamydatus evanescens** Boh. (Plagiognathus id. Br. Cat.).

Boh. Öfr. V.A. Förh., ix, 70, 25 (1852); E.M.M., Nov., 1894.

This species is distinguished from *C. wilkinsoni* by its less shining surface, coarser, more conspicuous, yellowish-white pubescence and black antennae; from *C. saltitans* by the unspotted elytra, less shining and more coarsely pubescent surface, and longer third and fourth antennal joints. The antennae have the second joint thickened as in *saltitans*, the third and fourth joints subequal in length each being about $\frac{4}{5}$ of the length of the second; the hemielytra have no apparent membrane; femora testaceous at apex, and tibiae testaceous at apex and darker at base; the spines, which are fine and black, do not spring from black spots. Length, $1\frac{1}{2}$–$1\frac{3}{4}$ mm.

Ova and **Larvae.** Unknown.

Life-cycle. The imago has occurred in this country in August, and on the Continent in May and June.

Habitat, etc, It was found amongst *Sedum* at Colwyn Bay, Carnarvonshire, where Beaumont took a few specimens. According to Reuter it occurs at the roots of grasses in sandy places and on stony hills, and according to Reuter and Puton on *Sedum* and *Sempervivum.*

It will be noticed that in this genus *Chlamydatus*, as with so many of the *Lygaeidae*, the habit of living on the ground is associated with that species of dimorphism which results from the curtailment of the organs of flight in both sexes, the unique instance amongst the British *Capsidae.*

Distribution. It occurs in suitable localities in Scandinavia, Germany, France, and Hungary, but in Britain there is no other record than that of the original capture in Carnarvonshire in 1890, on a portion of the coast which is now enclosed in connexion with the provision made for visitors by the greatly extended parade at that popular watering-place.

[**Neocoris nigritulus** Zett. (Plagiognathus id. Br. Cat.).

According to Reuter (24), we have not in this country the true *N. nigritulus*, but only what he at first described as its var., *scotti* Fieb., which, however, he afterwards found is not a var. of *nigritulus*, but of *bohemani* Fall., so that Saunders was correct in his surmise that our so-called *nigritulus* and *bohemani* are but vars. of the same species. *N. nigritulus* must therefore be deleted from our catalogue, leaving us only *N. bohemani* Fall. and its var. *scotti* Fieb.]

422. **Neocoris bohemani** Fall. (Microsynamma id. Osh. Cat.; Plagiognathus id. Br. Cat.).

Fall. Hem. Suec., i, 106, 58 (1829); D. & S., B.H. 424 (1865); Saund., H.H.B.I. 321 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs in July and August, var. *scotti* also in June.

Habitat, etc. It is found on sallows, especially *S. repens*, and *S. lapponum*, and is taken both by sweeping and by grubbing at the roots. Whittaker records it from thistles and ragwort, probably casual occurrences.

Reuter gives the following varieties :

> (*a*) Nigra, capite margine verticis utrinque margineque postico anguste luteis ; antennarum articulo secundo apice ferrugineo ; scutello macula utrinque basali tertiaque media luteis ; hemelytris nigris, corii margine laterali ultra medium luteo-testaceo. (*Neocoris putoni* Reut.)
>
> (*b*) Praecedenti cetero omnino similis, sed corpore supra in piceum vergente ; pronoto et scutello linea media longitudinali lutea, cuneo basi angustissime pallido, membrana levius infumata, venis pallidioribus. (*Microsynamma scotti* Fieb.)

Distribution. It occurs throughout almost the whole of Europe, and also in Asia Minor, Siberia, and North America. In Britain it is recorded from only three English counties, viz. Cheshire, Kent, Devon, and var. *scotti* from Lancs, Kent, Devon, and Glamorgan. There are no records for either Scotland or Ireland.

423. **Sthenarus roseri** H. S. (Plagiognathus id. Br. Cat.).

H.S. Wanz. Ins., iv, 78 (1839); Saund., H.H.B.I. 319 (1892).

Ova and **Larvae.** Unknown.

Life-cycle. The imago occurs in July and August.

Habitat, etc. It is found on sallows. It is a most variable insect, and Reuter describes the following seven varieties :

> (*a*) Hemelytris nigris, corio vittula humerali brevissima punctoque obsoletiore basis cunei albidis ; membrana dimidio basali cum areolis albida, venis pallide flavo-testaceis ; antennis nigris, articulo primo summo apice paullo pallidiore, ultimo saepe apice ferrugineo. ♂. (*Capsus geniculatus* Stål.)
>
> (*b*) Hemelytris, corio, clavo et cuneo totis nigris, unicoloribus ; membrana et antennis omnino ut in var. (*a*). ♀.
>
> (*c*) Omnino ut var. (*a*), sed minor, antennarum articulo primo apice

late ferrugineo, membrana fusca, venis fuscescentibus, tantum macula minus-determinata ad apicem cunei pellucida. ♂. Long. 3 mm.

(*d*) Minor, niger vel piceo-niger, pronoto margine antico limboque laterali latius picescentibus ; corio basi, sutura clavi sat late margineque laterali nec non cuneo extus picescenti-testaceis, hoc intus et apice late nigro-piceo ; spinulis tibiarum e punctis sat magnis nascentibus ; pectore densius albo-squamoso ; cetero ut in var. (*b*). Long. 2¾ mm.

(*e*) Hemelytris sordide albido-testaceis, apice embolii et cunei fuscescentibus, corio plaga maxima cuneiformi fusco-nigra vel nigra notato ; membrana fumata, areola majore paullo obscuriore, areola minore maculaque sat magna ad apicem cunei albidis, venis testaceis ; antennis nigro-fuscis, articulo primo, basi excepta, secundique annulo medio ferrugineis, duobus ultimis saepe apicem versus ferrugineis. ♀. (*Capsus saliceticola* Stål.)

(*f*) Subtus cum capite nigro-fusca, hoc margine verticis paullo dilutiore, pronoto et scutello rufescenti-fulvis, illo callis piceis ; hemelytris flavescenti-fulvis, innotatis ; antennis ferrugineis, articulo primo basi, secundo basi et apice, tertio et quarto basi fuscis ; femoribus nigro-piceis, apicem versus late rufo-ferrugineis, tibiis testaceis, anticis fere innotatis, posticis praesertim basin versus e punctis minusculis nigris nascentibus ; membrana pallida, venis testaceis.

(*g*) Fuscescenti-ochracea vel ochraceo-flava, capite vel toto vel tantum vertice piceo, margine postico ferrugineo vel ochraceo ; pronoto callis saepe piceis ; scutello interdum nigricante vel fuscescente, rarius pronoto et scutello fere aurantiaco-rufis ; hemelytris corio plaga magis minusve dilatata nigro-picea, interdum fere obsolete, cuneo saepe aurantiaco, membrana cum areolis pallide testacea, tantum limbo latissime arcuatim nigricante (♂) vel pellucide infuscata, areolis venisque pallidis, ad cuneum macula majore albida (♀) ; antennis fuscescenti-ochraceis vel ochraceis, basi articuli primi et secundi nigra, ultimis saepe paullo obscurioribus et tertio basi nigro ; femoribus ferrugineis, apice tibiisque testaceis. ♂ ♀. (*Sthenarus vittatus* Fieb.)

Distribution. It is found chiefly in Northern and Central Europe, but also in Asia Minor and Siberia. In Britain it is recorded from eleven English counties, viz. Lancs, Norfolk, Suffolk, Cambs, Middlesex, Kent, Surrey, Sussex, Hants, Wilts, and Somerset. There are no records from Wales, Scotland, or Ireland. Hence the most northerly limit is Lancashire.

424. **Sthenarus rottermundi** Scholtz. (Psallus id. Brit. Cat.).

Scholtz. Arb. u. Ver., sp. 42 (1846) ; D. & S., B.H. 422 (1865) ; Saund., H.H.B.I. 314 (1892).

Ova. Length ¾ mm. Cylindrical, of nearly uniform width throughout,

rather broad, truncated anteriorly, rounded posteriorly, bent in the middle; colour pale yellowish.

Larvae. Undescribed.

Life-cycle. The imago is found from June to September, maturing towards the end of the former month.

Habitat, etc. It occurs on *Populus alba* and *Alnus glutinosa*, especially the former; Carr gives also *Populus canescens*.

Reuter (12) describes the following varieties:

> (*a*) Clypeo maculaque majore frontis fuscis; pronoto fusco, marginibus lateralibus et apicali discoque macula media anteriore et vittulis 2–4 posterioribus magis minusve distinctis albidis; scutello fusco, apicem versus, pallido; hemelytris apice clavi corioque toto, margine laterali, vena cubitali anguloque apicali interno exceptis, fuscis; cuneo, basi marginibusque exceptis, laete rubro, membrana fere tota infumata, venis albidis, areola majore basin versus maculaque parva ad apicem cunei hyalinis.
>
> (*b*) Capite ut in praecedente; pronoto tantum callis lineolaque obliqua angulorum posticorum fuscis; scutello pallido, basi late triangulariter fusco; ipso apice suturaque clavi nec non vitta longitudinali lata utrinque ad venam cubitalem corii fuscis; cuneo ut in praecedente; membrana leviter infumata, venis albidis, areola minore tota, apice areolae majoris magis minusve late, lineola ad apicem venae cubitalis striolaque transversali infra maculam hyalinam ad apicem cunei positam fuscescentibus.
>
> (*c*) Ut praecedens, sed pronoto tantum callis fuscis, cuneo toto albido.
>
> (*d*) Ut praecedens, sed adhuc pallidior, colore in pallido-flavum vergente, fronte tantum punctis duobus mediis parvis fuscis; pronoto callis tantum fusco-marginatis; scutello toto pallido; corio plagis duabus longitudinalibus angustioribus, dilute fuscescentibus; membrana ut in var. (*b*).

The dense white scale-like pubescence led Saunders to refer this insect to the genus *Psallus*.

Distribution. It inhabits the greater part of Central and Southern Europe and Algeria. In Britain it is recorded from sixteen English counties, viz. Derby, Notts, Leicester, Norfolk, Suffolk, Cambs, Glo'ster, Oxon, Bucks, Herts, Essex, Kent, Surrey, Hants, Berks, and Somerset. The only Welsh record is from Glamorgan. There are none from Scotland or Ireland. Hence the northernmost limit is Derby and Notts.

425. **Asciodema obsoletum** Fieb.

Fieb. Wien. Ent. Mo., 227 (1864); D. & S., B.H. 391 (1865); Saund., H.H.B.I. 323 (1892).

Ova. Unknown.

Larvae. Last instar, 2½ mm. Greyish-green, with a scattered and rather long pale pubescence; head and middle of abdomen a little darker; eyes dark; pronotum with three dark squarish patches; antennae and rostrum rather stout, joints of former in order of length, 2, 3, 4, 1, apical joint of latter black; tibiae with a short pale adpressed pubescence and a few longer fine black hairs; tarsi slightly infuscated, two-jointed, with basal joint almost invisible above, extending about ¼ of length of tarsus beneath; wing-pads projecting beyond sides of abdomen, and extending rather less than half-way down it.

Life-cycle. The imago occurs from July to September, and I have taken the fully grown larva also in July.

Habitat, etc. It is found on furze (*Ulex europaea*) and broom. Morley (4) gives also hazel and *Hypericum*, these probably accidental.

Distribution. Outside the British Isles, this species inhabits Central and Southern Europe. In Britain it is a common and widely distributed species, being recorded from twenty-two English counties, viz. all the coast counties from Northumberland to Cornwall, except Dorset, together with Cumberland, Derby, Notts, Hereford, Glo'ster, Bucks, Herts, Middlesex, Surrey, and Wilts. The Welsh localities are in the counties of Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland. In fact, it seems to be a very general accompaniment of furze bushes, wherever they may be found.

426. **Asciodema fieberi** D. & S.

D. & S., B.H. 420 (1865); Saund., H.H.B.I. 323 (1892).

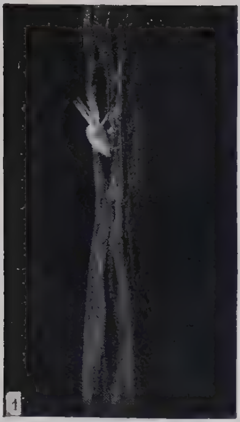
Ova. Unknown.

Larvae. Last instar, 2¼ mm. Delicate green, with white legs and antennae, and yellowish wing-pads; abdomen showing its dark contents through the skin; apex of rostrum black; tibiae with pale hairs, whereas in the adult they are black.

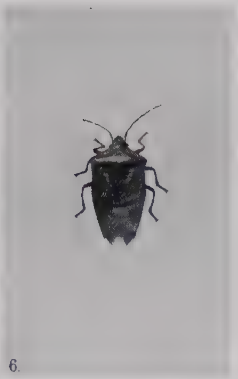
Life-cycle. The imago has occurred from June to September.

Habitat, etc. It has been taken on wych elm, and also on palings.

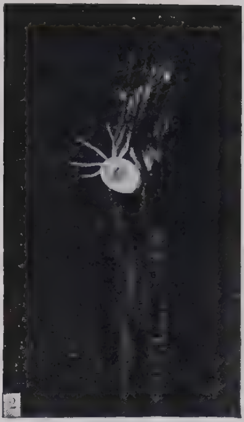
Distribution. Hitherto this insect has been found in the British Isles and Austria only. It is recorded from eight English counties, viz. Cumberland, Lincs, Glo'ster, Oxon, Herts, Surrey, Somerset, and Devon. It is also recorded from Ireland, but not from Scotland or Wales.



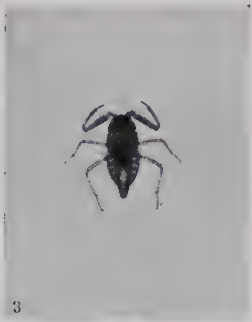
1



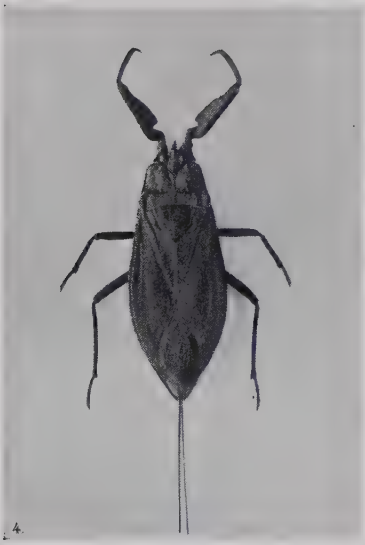
6



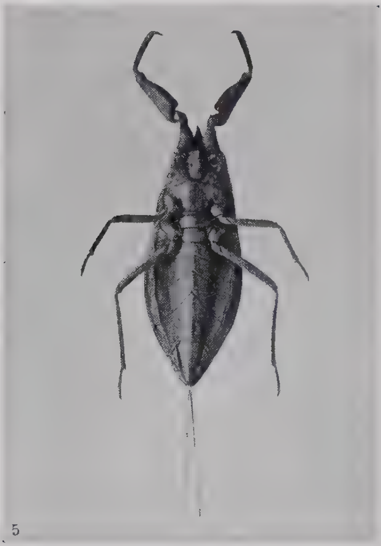
2



3



4



5

PLATE VI.

1. Egg of Nepa cinerea L. in decayed pond weed. 2. Ditto, after hatching. 3. Nepa cinerea L. newly hatched. 4. Nepa cinerea L. adult. 5. Nepa cinerea L. adult, under side. 6. Acanthosoma interstinctum L.

H. Main, photo.

SECTION II. CRYPTOCERATA

The Cryptocerata, for the most part, inhabit ponds, lakes, canals, and wet ditches, and sometimes the margins of streams and rivers, living, not on the surface, as do the *Gerridae*, but actually in the water itself. As a rule they frequent fresh water, but a very few species of *Corixa* are to be found in the brackish water of salt marshes. The Palaearctic species fall readily into six well marked families without connecting links, but two of these, the *Pelegonidae* and *Belostomatidae* are not represented in the British Fauna. The *Pelegonidae* consist of species which run about on the muddy banks of ponds and marshes, and do not enter the water itself; they are called toad-bugs and occur chiefly in tropical countries, and only three Palaearctic species have been described. The *Belostomatidae* contain the largest and most powerful of all heteropterous insects, some of them reaching a length of 3½ inches, with an expanse of wings of over 6 inches. The ♂ of some of these insects has the remarkable habit of carrying the eggs attached to its back.

In accordance with their subaqueous habits, the Cryptocerata are highly specialised in various directions. The antennae, in all cases, are very short, though correspondingly stout, and are concealed in cavities at the sides of the head, so that, unless specially looked for, they are apt to escape notice altogether. It is from this peculiar position of the antennae that the name of the section (hidden horns) is derived. The reduction in length and the practical enclosure of the antennae must be of considerable advantage to the insects in their progress through the water, when antennae of the normal type would be very much in the way. Such a modification is paralleled in the *Gyrinidae* (whirligigs) amongst Coleoptera. The majority, again, have the horizontally working and inwardly fringed posterior limbs, which are also to be found in the aquatic Coleoptera. In these two instances, therefore, we have an independent development, under similar conditions, of corresponding structures in widely separated orders, which is decidedly interesting. Almost all the species are fully winged, and there is abundant evidence that they often leave the water during the night for flight, returning to it again before daybreak. In this way newly formed ponds soon become populated, at least with certain of the more vagrant species. The larger species are certainly carnivorous, subsisting upon animal juices, and in such cases the rostrum is short and strong, often able to inflict a painful wound on the hand of the incautious captor. The food of the smaller forms is not easy to determine, but it seems probable that at least some are either entirely or partly vegetarian. As all breathe the air directly, recurrence to the surface is necessary for purposes of respiration.

The British Fauna contains 36 or 37 species of Cryptocerata, very unequally divided amongst the four families, the *Corixidae* alone containing at least 30 of the number. This is quite in accord with the Palaearctic Fauna as a whole, for out of 158 species contained in Oshanin's List, 101 belong to the *Corixidae.*

The Cryptocerata are subject to the attacks of the larvae of water-mites of the family *Hydrachnidae,* to which they serve as hosts. "When the Hydrachnid larvae leave the egg, they have six legs instead of eight. They attach themselves as soon as possible to their unfortunate hosts, and fix their mouth organs firmly into the insect, growing as fast as the nourishment they get will allow. But they grow only in the soft-bodied part, the dorsal plate, the epimera and the legs remaining the same size as at first. In most cases, after a time, the legs fall away, being of no further use. Later on, the nymph can be plainly seen inside the semi-transparent envelope, and in the spring the envelope breaks, and the mite escapes as a free swimmer with eight legs, and is known as the nymph. The case from which the mite has escaped remains attached to the insect" (Soar, 2).

According to C. T. Brues, minute Hymenoptera of the genus *Ziphodytes* are parasitic upon the eggs of aquatic Hemiptera, and Enock bred *Prestwichia aquatica* also from them.

Family XIV. **NEPIDAE.**

The *Nepidae* consist of the so-called "water scorpions," which are of world-wide distribution, and of very uniform structure, in whatever quarter of the world they are found. Notwithstanding the extreme difference in appearance between the broad, flat *Nepa,* and the narrow, elongate, subcylindrical *Ranatra,* the essential principles of their construction are the same. There is first the same peculiar modification of the fore limb into a raptorial organ which is quite useless for ambulatory purposes, so that the insect has no more than four legs available for ordinary progression. The fore limb is composed of the usual parts, but much modified for their special purpose; the coxa has become elongated and free, and is, in consequence, pushed forward in front of the thorax so as to be visible from above, thus revealing to such a view a part of the anatomy which is in almost all insects concealed by the intervention of the thorax; then the large trochanter is attached to the whole width of the coxa at one end, and to the femur along the side of the other, thus cutting off these two parts from one another so that they do not meet, and it seems as if the insect has an extra joint in its leg; the femur is inwardly grooved with a channel into which the tibia and tarsus can be folded back when not in use ; the tibia is curved to fit this groove, and the tarsus consists of one joint only, which is clawless, but ends in a sharp point ; thus by the suitable modification of each successive part, the whole forms a raptorial organ of great efficiency. In this family alone of the British Cryptocerata (except *Plea*) the posterior legs are not of the natatorial type, but of the form which is usual for land progression. Nevertheless, both the intermediate and posterior pairs can be used for natation, though of a not very effective kind ; the right and left limbs of each pair are then, of course, moved simultaneously like the legs of a frog, and not alternately as in ordinary land progression. This is the procedure when the insect finds itself in open water and not at the bottom ; in such case the fore limbs, at least in *Ranatra*, are used to assist the movement, being opened out, and striking the water vertically ; but the posterior pair give by far the most powerful impulse ; notwithstanding all these efforts, however, the progress through the water is but slow, and its direction uncertain. Movement on the bottom or amongst the subaqueous vegetation is accomplished by the last two pairs only, and in the ordinary quadrupedal fashion of alternate movement.

Secondly, there are the same caudal respiratory appendages ; each of these is an extremely narrow, very elongated plate, or strap, flat outwardly and grooved inwardly so as to produce a rather capacious channel ; the margins of this channel are fringed with long hairs pointing towards the apex, so that when the two filaments are applied to one another, a tube is produced, which is rendered continuous and impervious at the junction of its halves, by the crossing of the hairs. In Miall's "Aquatic Insects" it is said that the tube formed by these respiratory filaments has its continuity "maintained by a multitude of hook-like bristles, which project from the opposed edges." I cannot, however, find any trace of such hook-like bristles, the only organs being the above mentioned flexible and silky hairs, which are quite adequate for the purpose indicated. This apparatus communicates at its base with the tracheal system through a pair of spiracles. When the distal extremity of the tube thus made is brought to the surface of the water, air in some way passes along it and enters the tracheae, though the exact *modus operandi* has yet to be discovered. Of course, the insect would at the same time practise its exspiration and get rid of carbon dioxide.

Of the salivary glands of the *Nepidae*, Bordas states, "Elles sont disposées en forme de grappe simple, dont les divers lobules ou *acini*, séparés et indépendants, vont s'ouvrir dans un conduit collecteur central cylindrique."

The *Nepidae* are carnivorous ; they remain motionless for hours concealed in the mud of the ponds or canals in which they live, or clinging to the stems of water plants, lying in wait for such prey as they can overpower, not sparing their own kin, though seemingly content at times with such small fry as *Daphnia* or *Cyclops*, among the Entomostraca. Although in a " hand-to-hand " fight they would stand no chance with the fierce *Notonecta*, yet such is the grip of their raptorial front legs, that an unlucky water boatman venturing heedlessly within range of the stroke of the silent scorpion will be seized and sucked without being able to struggle successfully, or use its powerful beak to advantage.

The *Nepidae* also suck fishes' eggs, and even attack small fish and tadpoles (Kirkaldy, 8).

The articulation of the posterior coxae in the *Nepidae* is of the type known as trochalopodous, or rotatory, while all the rest of the Cryptocerata are pagiopodous (fixed or non-rotatory). For this and some other reasons, such as the raptorial character of the forelegs, and the shortness of the rostrum, Kirkaldy considered them as phylogenetically associated with the *Reduviidae* and as being, therefore, more correctly placed apart from the *Naucoridae*, etc., and in close juxtaposition with the *Reduviidae.* However that may be, it can scarcely be maintained that *all* the different families of the Cryptocerata have a close genetic relationship ; the nature of their life and the structural peculiarities that adapt them for it made it at least convenient to group them together.

Only a few species of *Nepidae* are known, and the Palaearctic Region contributes a dozen to the total. In Britain we have but two.

427. **Nepa cinerea** L.

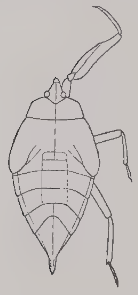
Lin., F.S. 906 (1761) ; D. & S., B.H. 584 (1865) ; Saund., H.H.B.I. 327 (1892).

Ova. The ova are of a whitish ochreous colour, suffused with pink, oval and provided at one end with a circle of seven filaments, which in the ovary enbrace the preceding ovum. These filaments supply the egg and the embryo within with air. On May 3rd, 1899, Mr. F. Enock exhibited at a meeting of the Entomological Society of London, eggs of *Nepa* lying *in situ* in decayed leaf-stalks of *Alisma.* " The eggs were laid in an incision made by the female, each being pushed in up to the base of the expanded filaments at an angle of about 30° ; the next egg above was placed close to the first and cemented to it, the filaments interlacing with one another. Sometimes a row of nine or ten were laid in this manner." (" Proc. Ent. Soc. Lond.," 1899, xiv.) The eggs are, however, sometimes laid singly. Before the emergence of the larva the filaments at the apex of the egg are more or less upright, but after emergence they spread out in a radiating circlet (H. Main). Two specimens in my collection show only six filaments.

Leuckart describes the egg as follows : " The crown of rays is placed excentrically, inclining towards one side of the egg ; the anterior end of this side, which, because of its less convexity I regard as the dorsal, is obliquely truncate, and forms a round area, the circumference of which is bounded by seven long, diverging rays ; the lower ends of these rays are clavately thickened and in direct contact with one another ; above this cone of rays the anterior pole of the egg projects a little, and just here are found the micropyles, which might easily be overlooked ; there is no lid ; the chorion consists of two lamellae, which, with the exception of a small circular area at the hinder pole, can be easily separated and have a different structure ; the outer, stronger and thicker lamella, the exochorion, shows hexagonal spaces on a finely granulated surface, separated from one another by a delicate tracery, and carrying from four to twelve round knobs ; the middle of the knob is marked with an opening which leads into a fine canal passing through the whole thickness of the chorion ; the inner lamella, the endochorion, is very delicate and tuberculated ; it carries a number of small, closely set prominences, the spaces between which are instantly filled with air through the canals of the exochorion as soon as the egg is brought into contact with it. Towards the anterior end of the egg and the crown of rays, the exochorion has generally a somewhat irregular appearance, while the limits of the divisions lose their earlier distinctness and the number of the knobs upon them is considerably reduced ; at the same time the canals which originated in the middle of the knobs are obliterated ; the knobs themselves become flat and thus the upper surface of the chorion appears, on the places mentioned, and especially in the circle of the crown of rays, almost as if rubbed or plastered. Between the roots of the rays the exochorion presents a new form ; it shows here a considerably developed trellis-work which encloses trough-shaped pits of irregular hexagonal form and reveals some small tubercles between. This form also produces only a modification of the usual texture of the exochorion. The rays appear as solid processes or sprouts of the chorion like the horns on the eggs of certain *Muscidae*, although they differ from these in consisting, in agreement with the usual nature of the chorion, of two layers lying upon one another, an axial and a cortical layer. The first is a process of the endochorion ; it is spongy and encloses numerous small spaces which are connected with the air-spaces between the endo- and exochorion. In contrast to this axial layer, the cortical layer, which represents a continuation of the exochorion is entirely homogeneous and strong. It does not show any traces of the usual texture which we found in the exochorion ; but it is only the lower half of the rays in which the exochorion has this simple structure ; in the upper half it is pierced by numerous closely placed canals which lead into the spongy mass of the axial layer.

The egg of *N. cinerea* is imbedded in the stems of certain water-plants. The carbon dioxide which is produced during the course of development is no doubt collected in the air-spaces between the two layers of the chorion, and these air-spaces are in direct contact with the surrounding oxygenated water only in the rays, through which, therefore, oxygen reaches the yolk.

The two micropyles lie close together, and appear as simple canals, piercing the chorion in a somewhat divergent direction. Their circumference is quite smooth and of a brownish colour.


Young larva of *Nepa cinerea* L.

Larvae. In form the larva, in all its instars, is similar to the adult; the colour is pale brown in the younger stages and dark piceous brown in the two latest. In the last two instars the fore parts are more or less hirsute, but in the earlier stages this is only very slightly the case. There is no trace of the bright scarlet colour, which appears on the dorsal surface of the abdomen in the adult; and it is obvious that if any such colour were present the insect would be most conspicuous, whereas its predatory habits require that it should be as much concealed as possible; in the adult, the scarlet dorsum is entirely concealed by the opaque hemielytra, and the insect remains therefore as inconspicuous as in its larval condition. In a specimen measuring 7 mm. to the apex of the respiratory tube, the beginnings of the hemielytra are slightly indicated on the mesonotum, though there is scarcely any trace of the wings in the metanotum. In the next instar, measuring 10½ mm. the hemielytra are much more developed, and the wings are traceable as a produced margin of the metanotum. In the final larval instar, measuring 16 mm. the wing-pads have assumed the usual form, the rudimentary hemielytra completely overlapping the wings. In all the instars the caudal respiratory apparatus is of the same kind, appearing as a blunt conical protuberance measuring 1½ mm. to 3 mm. in length. It is cleft, at least beneath, and therefore presumably functions in the usual way.

Figures of the five larval instars were given by Rösel in 1855.

Life-cycle. The imago has been found from March to October. There can be little doubt, however, that it occurs practically all the year round, for the eggs are produced in May, and larvae may be had during the summer months, and even so late as September. Thus it would appear that the insects mature towards the end of summer and in early autumn, and that the imagines exist throughout the winter, laying the foundation for the new generation in the spring of the following year. It has been thought that they bury in the mud at the bottom of the pond at the end of autumn, and remain thus in retirement till the approach of spring. According to De Geer, the insect takes about two months to complete its metamorphoses.

Habitat, etc. *Nepa* lives in ponds, usually at the bottom, except when it is necessary to come to the surface for air. To inspire, the insect creeps backward along a submerged weed till the tip of the breathing tube breaks the surface of the water. Here it remains in a sloping position till the needful exchange of gases has taken place.

It is evidently very prolific. De Geer, on opening a ♀ on May 13th, found in it twenty-four eggs.

It is highly carnivorous, and the prehensile fore limbs are used with good effect in the capture of prey. It feeds mostly on small insects. These it can catch not only in, but also out of the water. The Rev. T. Wood once found a specimen which had buried itself in mud about five or six inches from the edge of a pond, leaving merely the tips of the jaw-like anterior limbs projecting above the surface, and in these it was holding a struggling fly. Curtis credits this insect with feeding upon tadpoles, whether alive or dead. It moves in a leisurely way over the bottom of the pond and often lies flat upon the mud, when it is not easily distinguished, as its colour so completely harmonises with its surroundings.

It sometimes leaves its pond for excursions on shore; J. E. Mason found one walking on a drain-bank amongst reeds in July. It can fly well, but its aerial excursions seem to take place chiefly by night. It is evident that flight must be a sufficiently frequent exercise to check any tendency to the abortion of the flight-organs, which would surely ensue upon the lack of such use. In this connexion, it may be noted as a curious fact that the only time when the scarlet body is exposed to view is during flight, and of course, if this is at night, the colour would then be indistinguishable. What then can be the purpose and significance of this brilliant colour, which appears also in *Ranatra*?

Lefebure claims to have discovered a poison apparatus in *Nepa*, consisting of a small pair of glands lying between what he calls the appendicular glands and the oesophagus. These secrete a milky fluid which, when inserted beneath the human skin, produces a pustule, while the secretion of the salivary glands does not.

The following account of the courtship and copulation of *Nepa* is given by the late Mr. C. Gordon Hewitt ("Ent. Soc. Lond. Trs.," 1906, p. 87 ff). "There are no preliminary amorous passages in the courtship of *Nepa*. This may possibly be accounted for by several facts. The antennae, which play such an important part in the courtship of those insects whose habits at this stage have been studied, are too short to be of any use in these operations, so that we do not find any 'caressing of antennae,' nor do they appear to be of use for perceiving the presence of the female, as far as can be observed. The movements of the male *Nepa* are in accordance with its usual habits. On perceiving a female, whether it is by sight or by some sense of smell, I cannot say, he advances till he is within a short distance, and then with a slight dart he seizes her, and crawls in an awkward manner on to her back. The female generally struggles to rid herself of the male at first, but if the male has made sure of his hold, she gives in. The male usually approaches the female from behind or from the side, but he often advances *vis-à-vis*, and then, having made firm his hold on the back of the female, he very carefully turns round till both face the same direction; it is during this manoeuvre that the female often manages to get rid of the male.

" The chief interest in the copulatory process of *Nepa* lies in the method of disposition of the respiratory setae, so that the male and female genital organs may be *in coitu*, and at the same time both individuals may receive a supply of air for respiratory purposes. The male bends down the end of its abdomen underneath that of the female so that the coitus can take place. This awkward position causes the proximal ends of the setae forming the respiratory siphon to separate somewhat, but they are brought in as close juxtaposition as possible; the distal end communicates with the air as in the female; the siphons of both male and female are in close proximity. In the individuals observed, copulation took place in the evening, and lasted till the following day. It was interesting to note that the female during copulation did not seem to mind the presence of the male in the least, and continued feeding."

Like most other hemipterous insects that live in ponds, *Nepa* is subject to the external parasitism of the larval forms of Hydrachnid mites, which appear as red, more or less globular masses attached to the limbs or other parts of the body. Dugès identified one of these as *Hydrachna globosa* De G.

Distribution. *Nepa cinerea* is found throughout the Palaearctic Region and also in North America. Its place in other parts of the world is taken by other species, belonging chiefly to the genus *Laccotrephes*. In Britain it is probably of general distribution. It is recorded from thirty-two English counties, the only omissions being Salop, Rutland, Hunts, Beds, Northants, Worcester, Monmouth, and Bucks. The Welsh records are from the counties of Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland, but apparently not commonly in the former.

428. **Ranatra linearis** L.

Lin., F.S. 908 (1761); D. & S., B.H. 582 (1865); Saund., H.H.B.I. 328 (1892).

Ova. The egg is over $\frac{1}{8}$ of an inch long and is oval, and furnished anteriorly with a couple of long filaments. It is imbedded in a leaf, through which it projects, and the two filaments then open out, making with the egg the form of the letter **Y**, so that the egg is thereby prevented from slipping completely through the leaf. Enock (2) found the eggs, like those of *Nepa*, imbedded in the stems of *Alisma*. In one stem were 107 eggs, and in the other 97; these probably represented the produce of several parents. He had observed *Ranatra* ovipositing in leaves of water-ranunculus, *Potamogeton*, and *Alisma*, " but they seem to prefer the stems of *Alisma*, whether living or dead. *Ranatra* crawls upon a leaf, and taking hold firmly with her second and third legs, she raises the head $\frac{3}{4}$ inch from the leaf.

The raptorial legs are placed flat together and held in a line with the abdomen, the tip of which is depressed until it almost touches the leaf. The ovipositor is then extended and pressed against the surface ; a forward and downward movement being given, it is slowly driven right through the leaf, and then almost withdrawn, the egg, which is now $\frac{1}{8}$ of an inch long, being then extruded and forced into the hole." He adds also (1) on another occasion : "The long lateral filaments sprang open as the ovipositor was withdrawn ; the ♀ moved along about a quarter of an inch, and the process of boring the hole was repeated, the long respiratory tubes resting in the fork of the last laid, which was pressed home until the tip of the egg was just level with the surface of the leaf."

Larvae. The freshly hatched larva has no respiratory tube, and Miall considers that perhaps the insect at that period may not take in gaseous air at all.

Life-cycle. The course of development of *Ranatra* is probably similar to that of *Nepa.* I have records for the occurrence of the imago from January to July, and in September and October. The January record is that of two females captured by T. R. Billups at Loughton, Essex, in a locality at some distance from water. Notwithstanding the amount of attention that has been paid to the genus *Ranatra*, the life history of our British species does not seem to have been worked out in detail. Douglas found a nymph in a pond covered with mud, and as this muddy condition in water-bugs usually implies a habit of wintering buried in mud, he suggests the possibility that *Ranatra* may winter, at any rate sometimes, as larva. Kuhlgatz gives two weeks as the time the insect remains in the egg state, and Latreille says : "Ils restent quinze jours au fond de l'eau." Bueno gives the following particulars concerning *R. 4-dentata*, an American species closely allied to *R. linearis*, and it is probable that in the main outline the course would be similar with our insect. "The eggs are laid in the early spring in the decaying stems of rushes, and in the course of three weeks or so, the little bugs emerge. They very much resemble the adult except that they are, of course, much smaller. After five moults they reach maturity in some eight weeks or so."

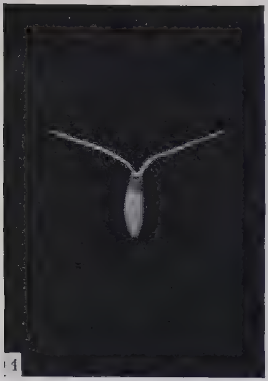
Habitat, etc. Like *Nepa*, *Ranatra* also occurs in ponds, and is carnivorous, feeding upon the water-fleas, especially of the genus *Daphnia* (Miall), larvae of *Ephemerae* (Westwood), and other aquatic creatures, even including tadpoles and small fishes ; it has been accused of attacking the eggs of carp. Bueno found that *R. 4-dentata* fed upon insects that fell into the water. Swammerdam has the following passage referring to *R. linearis* : "There is not perhaps in all the animal creation so outrageous or fierce a creature against those weaker than itself than the water-scorpion. It destroys, like the wolf among sheep, twenty times as many as its hunger requires. I have often seen one of these when put into a basin of water in which were thirty of forty of the worms of the middle *Libella*, which are at least as large as itself, destroy them all in a few minutes."

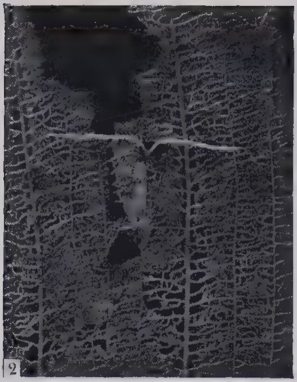
The movements of *Ranatra* are sluggish, and in consequence incrustations or eggs of other aquatic creatures are sometimes found upon its legs or caudal filaments. The method of breathing is the same in the adult as that of *Nepa*. There are very few direct observations as to its power of flight, though with such ample wings one would expect considerable power and frequent use. Amyot and Serville state that it flies by night, and there is a Russian record of a flight *en masse*. The only object of flight would seem to be the search for a new pond when the old one becomes dry or ceases to yield an adequate food supply. Bueno thus describes the taking flight of *R. 4-dentata*: "One *Ranatra* was taken perched on a lily pod, the tip of the siphons touching its surface and the legs straight and inclined backwards. This is much the position it assumes on taking flight. After balancing itself a moment in this position, the bug crouches far back with its legs much bent, and then suddenly leaps into the air with a loud whirring noise made by its wings. The prothorax is much bent forward, and the anterior legs are bent back over it just before the insect takes flight."

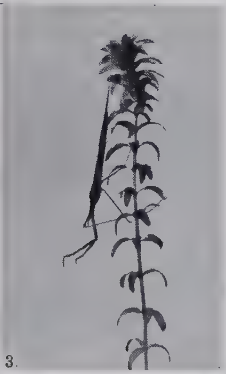
Gadeau de Kerville (3) describes a curious malformation in *R. linearis*, in the form of two elliptical swellings on the hemielytra, 7 and 10 mm. long respectively. Unfortunately nothing is said as to their nature, whether they were solid or hollow, whether resulting from the presence of a parasite, or merely a deformity. It was evidently a hibernated specimen, as it was captured near Rouen in March.

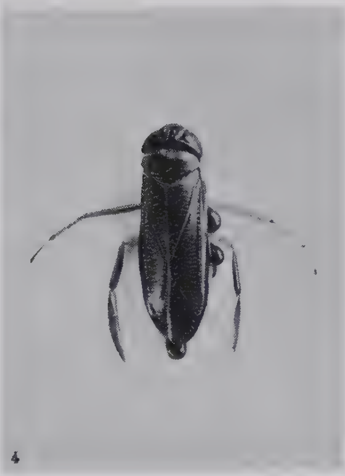
Bueno has described a stridulating apparatus which he found in the American *R. 4-dentata*. It consists of a "roundly triangular callosity made up of longitudinal lines and placed on the proximal end of the greatly elongated coxae of the anterior legs and a similar rasp on the front edge of the plate that bounds the coxal cavity outwardly. The leg is so placed that it is capable of very free vertical movement, but of restricted lateral one, and in the movements up and down these two rasps play upon one another, producing a chirping sound which is louder when the insect is in the water." ("Can. Nat.," 1905, 85–7). An examination of the same parts in our British species has shown me a trace of a structure similar to the above, but there is yet no very definite evidence as to the actual production of a sound by our species.

In walking on land, it raises the body, especially the fore parts, and walks on the intermediate and posterior legs only, using them in the customary quadrupedal fashion. The swimming is done mainly by the hind legs, which are then moved simultaneously and with a graceful sweeping motion like that of a frog's hind legs. The intermediate legs are also moved simultaneously when not used for walking, but in a less rhythmical way, and their backward motion generally coincides with the forward movement


1


2


3.


4

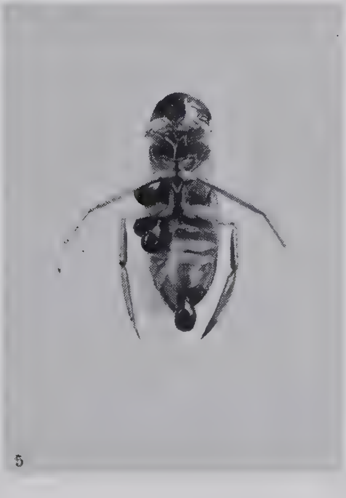

5

PLATE VII.

1. Egg of Ranatra linearis L. 2. Ditto in decayed leaf of Potamogeton. 3. Ranatra linearis L. adult, on pond weed. 4. Corixa parasitised by larvae of Hydrachnidae. 5. The same, under side.

H. Main, photo.

of the hind pair. The raptorial legs are sometimes moved vertically in the water as if to aid in progression. The rostrum is cleaned by being rubbed between the fore legs, which are bent back upon their long coxae for the purpose.

From the eggs of this species Enock (1) bred both ♂ and ♀ hymenopterous parasites of the species *Prestwichia aquatica*. Ussing records that twelve ♀ and four ♂ of this parasite were obtained from one ovum of *Ranatra linearis*. It may be wondered how this minute hymenopterous insect can gain access to the eggs in order to deposit its own eggs in them, seeing that they are always in the water, while the Hymenoptera as an order have less to do with water than any other large body of insects. And, indeed, the presence of a hymenopterous insect moving about at its ease *in water* was so extraordinary an occurrence as to seem incredible to its discoverers. Sir John Lubbock (Lord Avebury), who was the first to behold the wonder, thus writes about his sensations : " Great was my astonishment . . . when I saw in the water a small hymenopterous insect, evidently quite at its ease, and actually *swimming* by means of its wings. At first I could hardly believe my eyes, but having found several specimens, and shown them to some of my friends, there can be no doubt about the fact. Moreover, the same insect was again observed, *within a week*, by another entomologist, Mr. Duchess, of Stepney. . . . It is a very curious coincidence that, after remaining so long unnoticed, this little insect should thus be found simultaneously by two independent observers." *Prestwichia* is a minute insect measuring not more than $\frac{1}{25}$ inch in length. The eggs of water-bugs, therefore, though always immersed in water, are no more immune from the attacks of hymenopterous parasites than those of land-bugs.

In " Science," xix, p. 212, S.J. Holmes describes experiments which seem to show that *Ranatra* (at least the American species experimented upon) is sensitive to light, manifesting, in fact, a positive phototaxis, i.e. showing a tendency to turn *towards* the light. Individuals which he kept in water, " kept swimming vigorously for a long time in the endeavour to go towards the lightest portion of their environment. When taken out of water, *Ranatra* at first feigns death, lying practically motionless for several minutes. If a strong light is moved about near them, they come out of their feint much more quickly than when left entirely alone, and soon begin to follow the light with much vigour. The first responses, however, are slight, and consist of small lateral movements of the head when the light is moved from side to side. Shortly after this the animal will respond by vertical head movements as the light is moved back and forth over the long axis of the body. Moving the light round in a circle, the head responds by circular movements of a more regular and precise kind. Next following the head reflexes come the reflex movements of the respiratory tube, which becomes raised and lowered coincident with the head as the light is moved to and fro above the body. After a greater or less interval, the animal rises on its legs, and if the light is now moved from side to side, the body will perform swaying movements, leaning over strongly towards the side on which the light is held. The legs on the side towards the light are strongly flexed, and those on the opposite side extended. If the light is passed to and fro in a longitudinal direction, corresponding swaying movements are likewise performed. When the light is in front the animal bows down, when moved behind the anterior end of the body is elevated, often at an angle of 45°. If the light is moved round in a circle, the body follows with corresponding motions."

This insect is very subject to the attacks of water-mites of the family *Hydrachnidae*, the red globular larvae of which are often found attached to it in great numbers. C. D. Soar (1) reports of a specimen he found in Epping Forest, that it was "literally covered with red water-mite parasites of all sizes." From these he was able to breed a few specimens and to establish that the species of mite in question was *Hydrachna globosa* De G.

Distribution. *R. linearis* is found throughout Europe, and in Turkestan and Siberia. Its place is taken in other areas by closely allied species, of which no fewer than six enter the extreme east of the Palaearctic Region. In Britain it is recorded from twenty English counties, viz. the coast counties from Yorks to Glo'ster, except Lincs, together with Cambs, Warwick, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts. The only Welsh record is from Glamorgan, and there are none from either Scotland or Ireland.

Family XV. **NAUCORIDAE.**

In these insects we pass to an absolutely different type. The flat, oval body, which is characteristic of most of the water beetles belonging to the *Hydradephaga*, and which is so perfectly adapted to an aquatic life as to give the minimum of resistance in swimming, is here excellently illustrated, and it is obvious that there is no close phylogenetic relationship between this family and the preceding ; in fact, the only reason for placing them in close proximity is that point of structure which gives the name Cryptocerata to all these water-bugs, viz. the reduced size and concealed position of the antennae, which, of course, is simply an adaptation to the subaqueous method of their existence. The family is not a large one, but it is of world-wide distribution ; there is, moreover, not much beauty of adornment amongst its numbers, which are, however, practically very efficient as hunters, and there is a striking similarity by which they can always be easily recognised. Oshanin's Catalogue contains sixteen Palaearctic species, several of which are from Japan ; of these sixteen we have only two. The family is more fully represented in the tropics.

The genus *Aphelochirus*. In 1899, Dr. Horváth (7) published a synopsis enumerating four European species of this genus, two of which are therein mentioned as inhabitants of Britain, viz. *A. aestivalis* Fab., and *A. montandoni* Horv. Of these, the latter corresponds to what has hitherto been known amongst British authors as *A. aestivalis*, while the former seems to have been recorded by Horváth as British under a misconception. Two macropterous specimens were taken by Bosc in France, and these formed the material for the original description of *Naucoris aestivalis* by Fabricius. One of these passed into the hands of Prof. Westwood, who, in erecting the genus *Aphelochirus* in 1833, described this macropterous form, but included with it brachypterous examples which had a little before been taken in England ; these latter, however, really represent the insect called by Horváth *A. montandoni*. The figure given by Westwood in his "Modern Classification of Insects" is taken from Bosc's French specimen, now at Oxford, and this same insect was lent to Douglas and Scott to provide the figure contained in their "British Hemiptera"—a figure which unfortunately shows the antennae as if they were spinous processes of the pronotum. Their description, in the brief diagnosis, appears from the colour mentioned to refer to the macropterous form, while the detailed account applies ostensibly to a brachypterous form, which, however, the authors do not appear to have seen, but concerning which they seem to have gathered information from Fieber. The figure given by Saunders in his "Hemiptera-Heteroptera of the British Islands," represents *A. montandoni*, as does also the description of the species. No British examples of the typical *A. aestivalis* are known. It should be mentioned, however, that our British examples are rather larger than the continental specimens of *A. montandoni*, as shown in series in the British Museum; ours measure 10 mm. in length by 7 in breadth, whereas the measurements given for *A. montandoni* are 8½–9 mm. in length by 6¾–7 mm. in breadth. In 1912, however, Reuter threw some doubt on the specific distinctness of *A. montandoni* and *A. aestivalis*, notwithstanding the unlikeness of the extreme forms, and somewhat later Horváth accepted this view and united them. The fact remains, however, that our British examples have a very different facies from typical *aestivalis*, but agree with that of *montandoni*, and no truly British examples are known of any other than that of *montandoni* ; so that even if we accept the view that the two forms represent but one species, we still need, for the sake of clearness, to indicate the above facts in the terminology, and it will be best to speak of our insect as *A. aestivalis* Fab. forma *montandoni* Horv. Oshanin, in his latest catalogue, gives the two as distinct species, of which *A. aestivalis* is somewhat more southern in distribution. Of course, the true test would be in breeding.

429. **Aphelochirus aestivalis** Fab. forma **montandoni** Horv.

Horv. Synops. Aphelo. Term. Füz. (1899).

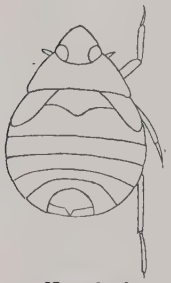
Ova. The following description is given by Ussing : "The eggs are oval and yellowish, with similar poles and a thick shell. Length 1 mm. The structure of the shell seems to consist of numerous hexagons, the size of which varies in different parts, giving the general impression of a honeycomb."

These eggs were found in the estuary of a river in Denmark, and were laid on the shells of various Mollusca, such as *Paludina vivipara*, *Cardium*, *Scrobicularia*, and *Tellina*. In the case of the bivalves, the eggs were found only on dead shells, and on the outer surface of these.

Larvae. An early instar, probably the second, 3 mm. Oval, testaceous, with brownish stains in centre of abdomen and at anterior margin of pronotum ; head deeply sunk in pronotum, to the extent of about two-thirds of the eye (which is black) ; thoracic segments longitudinally feebly carinated in centre ; mesonotum much shorter than either pro- or metanotum ; posterior angles of pronotum almost right angles, not rounded as in the adult ; hind margin of mesonotum angular in centre and slightly sinuate at sides ; abdominal segments forming a continuous lateral outline, and no trace of spines, sutures becoming successively more and more curved ; legs very pale ochreous ; tarsi one-jointed, hind tarsi very long, claws parallel ; whole surface very finely, almost imperceptibly, pubescent.

A later instar, 4 mm. Almost identical with the preceding, but with hind margin of mesonotum more abruptly angulated in middle, and more sinuate at sides ; hinder angles of abdominal segments slightly projecting.

Last instar, 7–8 mm. Very similar in form to adult, and proportionately much broader than early instars ; testaceous brown, with margins flavous and head and antennae testaceous yellow, legs yellow ; save for the lighter colour and smaller size, the superficial appearance is very much that of the brachypterous adult ; the differences are, head not punctured, body less rugose, posterior angles of pronotum sharper, mesonotum triangularly produced in centre, wing-pads not reaching hind margin of metanotum ; abdominal segments not spinosely produced at sides, but only very slightly pointed—so that the outline is practically continuous ; a very thin and extremely fine pubescence ; thoracic segments finely centrally carinated.



Nymph of *Aphelochirus aestivalis* F. forma *montandoni* Horv.

Ussing thus describes the newly hatched larva : "It is 2 mm. long and in the main resembles the imago. The chitin of the larva is so thin and transparent that the inner organs are easily seen. The abdominal segments end on each side in a small spine which, under the microscope, appears as if divided into two bristles. With the growth of the insect it disappears, and generally the segments develop the strong, backwardly directed spines."

Life-cycle. J. L. Brown (1), writing in July, 1874, says : "In the middle of June it was mostly in the larval form, six to one of the perfect insect ;

at the end of the month the perfect insect was much more abundant, and on the 20th inst. there was not more than one larval form in eight taken. I did not see any swimming about, nor did I get one winged specimen." The imago has been taken from May to November. Ussing says that the species over-winters both as larva and as imago, but not in the egg state ; the eggs are laid about midsummer. Ova, however, which he kept in an aquarium, did not hatch till the end of September and the beginning of October. He considers also that the imagines live more than one year. He found imagines from May to September, and they have been taken in England in October and November ; Ussing found larvae in March, May, July, August, September, and November. Apparently, therefore, the production of new individuals is a more or less continuous process except in the winter.

Habitat, etc. This curious insect appears to frequent, as a rule, running water rather than ponds. As mentioned above, however, it has been found in Denmark in estuarine waters. It swims very fast, using its hind-legs chiefly in doing so, but, on the other hand, it crawls very slowly, and then employs its two front pairs of legs (Westwood). Collins found it amongst *Potamogeton* which had been dragged out of the River Cherwell. J. L. Brown (1), who was more successful in the search for this insect than any one else, thus speaks of it : " This species is not scarce among weeds in a running stream at Costessy, about four miles from Norwich. I have also heard of a habitat in another stream at Earlham." And again (2) : " I have been out to-day in search of the winged form, but without success. I took in the course of an hour 102 specimens—80 full grown, wingless, and 22 larval forms, the smallest of the latter a quarter of an inch long in the body. They appear to be in the middle of the stream, among a broad-leaved species of *Potamogeton*, at least I get only one here and there along the edge of the stream. The place at which they abound is very constricted, not more than four or five yards in length ; above and below that spot they turn up sparingly, but there, at one working of the net, I have had from six to fifteen."

Gadeau de Kerville, who has captured it in great numbers in the Seine, has observed it feeding upon the larvae of the beetle *Haemonia*, and believes that it also preys upon the molluscs *Paludina vivipara* and *Bythinia tentaculata*. The last-named species deposits its ova on the back of *Aphelochirus*, thus curiously turning the tables on the insect.

It has been observed by Ussing to hide during the day and to come out at night ; he found also that some of the eggs were parasitised by the minute Hymenopteron *Prestwichia aquatica* Lubb. He obtained altogether fifty examples of the parasite, which has evidently made a paying business of its daring adventure into the forbidden element, where it has the field so much to itself.

No macropterous example is known of this form of *Aphelochirus*.

Distribution. Outside of Britain it is reported from Central Europe and Northern Russia. In Britain at the present time it is either very local or else difficult to find. It was first observed near Birmingham, at a spot that used to be known to collectors as the "Brimstone Well," and has since been found in damp places at Bagley Wood, Berks, and in a mill-pond at the Eynsham Paper Mills (Oxon) on the River Evenlode. But its chief locality, as above indicated, is in the neighbourhood of Norwich, at Costessy, where more specimens have been taken than anywhere else. It has, however, also been taken at Bathampton Wick River, near Bath, in September, 1888, quite recently by Mr. J. Collins, on weeds from the River Cherwell, also by Mr. Willoughby Ellis in Northamptonshire, and still more recently on the Notts side of a stream forming part of the boundary between Yorks and Notts. Thus it has occurred in seven or perhaps eight English counties, viz. Notts, Norfolk, Northants, Warwick, Oxon, Berks, Somerset, and perhaps Worcester. There are no Welsh or Scottish records, but it has occurred at Lough Neagh, in North Ireland.

430. **Naucoris cimicoides** L.

Linn., F.S. 245, 907 (1761); D. & S., B.H. 580 (1865); Saund., H.H.B.I. 325 (1892).

Ova. Dufour describes the egg thus: "Les oeufs de cette Naucore sont oblongs, cylindroides, un peu courbés, blanchâtres, très lisses, obliquement tronqués à leur bout antérieur; cette troncature est circonscrite par un filet sursaillant, ce qui lui donne une certaine ressemblance avec l'ouverture de ces petites coquilles terrestres appelées *Pupa*." The eggs are attached to the leaves of aquatic plants. Régimbart states that an incision is made in the stems of plants with the ovipositor, and that the egg is enclosed for about three-fourths of its length.

Larvae. The larvae are coloured similarly to the imago, but after death, they become more or less of a chestnut colour, and a good deal of this colour remains in the cast skin. A young instar, 3 mm. long, is practically parallel-sided instead of oval, and the head and thorax occupy more than half the total length. Of the three thoracic segments, curiously enough the mesonotum is much the smallest, and the metanotum the largest. The surface is shining and glabrous, but there are some very long hairs fringing the sides of the abdomen. The last larval instar, 11 mm. long, is much like the adult. The wing-pads reach no farther than the end of the metanotum. The connexivum is paler than the rest of the abdomen, and a little inside it each abdominal segment has an impressed transverse piceous line, followed outwardly by three or four short dashes in the same line. The anterior femora have a quantity of matted hair so placed as to be next to the tibia when that is shut back into the femoral groove. There are altogether five larval instars.

Life-cycle. According to Dufour, the eggs are laid towards the end of April; but Kirkaldy gives a month earlier. Very young larvae may be found in June, and examples not fully grown occur as late as September. The majority reach maturity late in August, but imagines have been found from March to December, so that evidently the species hibernates as imago.

Habitat, etc. This insect inhabits weedy ponds and ditches, where it lives amongst the vegetation and near the surface. It is a strong and very active insect, having in the net a movement very much like that of a water beetle, such as an *Ilybius* or an *Agabus*. It is ordinarily a lazy swimmer, but on the other hand, given the necessary conditions, it can attain a considerable speed. It can inflict a sharp and painful puncture with its rostrum. Morley (4) has found it in brackish ditches, as well as in freshwater ponds. It is carnivorous and very voracious. According to Rathke, the nymphs feed upon confervae. The habits of this species in copulation and oviposition are similar to those of *Corixa* (q.v.). The fore limbs, from their peculiar shape and lateral movement, are useless for any purpose other than the seizing and holding of prey, and the chief organs of locomotion are the hind legs, with which the greater part of the free swimming is done in the open ; but usually the vegetation amongst which the insect lives is so close that there is not much room for free movement. When placed upon its back on the ground, the insect spins round at a rapid rate, at the same time producing a buzzing sound, which appears to have been first noticed by Frisch in 1727, and is said to be produced at the neck. According to De Geer it often leaves the water at night to fly over land ; it is courageous and will attack any insect it meets. Like the other aquatic Hemiptera, it is subject to the parasitism of water-mites, but not to so great an extent. It emits from the anus a discharge, which Kirkaldy describes as " distinctly tart."

Distribution. It is distributed over the whole of Europe, and passes into Turkestan. In Britain it is recorded from twenty-one English counties, including the coast counties from Lincs to Glo'ster, together with Staffs, Notts, Hereford, Oxon, Herts, Middlesex, Surrey, Berks, and Wilts. The only Welsh record is from Glamorgan, and it is recorded from Scotland but not from Ireland. According to Kirkaldy, there is a specimen of *Naucoris maculatus* Fab. in Buchanan White's Collection at the Perth Museum, which is labelled " England." This species is common in France, and there seems no reason why it should not occur with us ; but the record is too indefinite to justify adding the species to our list at present. It may be distinguished by its brachypterous condition, the very finely rugose margin of the pronotum, and the mark of a W on the pronotum.

Family XVI. **NOTONECTIDAE.**

In this family we lose the lateral expansion of body and depressed form characteristic of the preceding, and find instead one which is compressed and vertically extended, arched above and flat beneath. The fore limbs are still raptorial, and the chief organs of locomotion are the hind pair. The family is of world-wide distribution, but the species are very ill-defined, exhibiting great variability in colouring, and presenting few good, salient, structural characters. One of the most important of these is the width of the vertex of the head which lies between the summits of the eyes, and is called the synthlipsis; this varies a good deal in different species, while constant in the same.

There are a dozen Palaearctic representatives of the family, if we reckon, as is generally done, the various forms found in this country as constituting only one species, but otherwise fourteen or fifteen. Of these we have only two (or five as the case may be), each of the two being the type of a different sub-family. The Pleina are numerous in the Oriental Region, and the Notonectina in America. One American species, *N. undulata*, serves as an article of commerce, being one of the chief ingredients in what is inappropriately called Mexican Cantharides (inappropriately as no vesicant is present); this is used in America and exported to Britain as a food for poultry and cage birds. In this food, sometimes the insects are entire and sometimes pulverised so that they appear in fragments only.

Of the salivary glands of the Notonectidae, Bordas states: "Elles sont presque complêtement incluses dans la tête, et recouvertes par la plaque occipitale, seul leur extrémité postérieur pénêtre légèrement dans la cavité prothoracique." This is curious, considering the enormous development of these glands in the surface bugs, the *Gerridae*.

431. **Notonecta glauca** L. and its associate forms.

Lin., F.S. 903 (1761); D. & S., B.H. 587 (1865); Saund., H.H.B.I. 329 (1892).

The different forms of this insect have generally been regarded as varieties of one species, seeing that, apart from size, the main distinctions hitherto noticed are those of colour only. The crucial test, of course, would be whether the different forms "breed true"; but no special investigations of this question have yet been undertaken. Mr. J. Edwards, in a paper communicated to the "Ent. Mo. Mag." for March, 1918, has treated our British forms as distinct species, on the grounds that no intermediate forms are known, and that, in some cases at least, structural differences are observable, and in these views I concur, at least provisionally, and until the matter can be finally decided as the result of breeding experiments. Hungerford maintains that the various American species can be distinguished by the form of the genital apparatus of the ♂. This has not yet been examined in our British forms.

Mr. Edwards (10) shows the distinctions of the species as follows:

1. (6) Metanotum black
2. (5) Expanse not exceeding 27 mm.

3. (4) Expanse 26–27 mm. Front angles of pronotum in the lateral aspect right angles or obtuse. Elytra brownish-yellow with more or less of blackish mottling, which originates next the costa and exceptionally extends over the disc. Wings usually with a white reflection; concolorous at the apex; Sc at the apex, Rs, r–m, and M in its distal half yellow, the remaining veins colourless. Abdomen beneath with the long hairs on the middle keel and on the inner edge of the connexivum pale brown in both sexes . . . . *glauca* L.

4. (3) Expanse 25–26.5 mm. Front angles of pronotum in the lateral aspect acute and projecting. Elytra sordid greenish-white with a row of irregular blackish spots from the base of the costa. Wings with a white reflection; narrowly fuscous at the apex; Sc blackish, Rs, r–m, and M dark brown. Abdomen beneath with the long hairs on the middle and keel on the inner edge of the connexivum black in the male, pale brown in the female *halophila* Edw.

5. (2) Expanse 31–33 mm. Elytra dark brown to black, with two yellow streaks at the base. Wings with a purplish-blue reflection; narrowly fuscous at the apex; Sc, Rs, r–m, and M dark brown, remaining veins colourless. Abdomen beneath with the long hairs on the middle keel and on the inner edge of the connexivum brownish-yellow in the male, pale brown in the female *furcata* Fab. (*marginata* Müll.).

6. (1) Metanotum orange-yellow with a black spot on each side of the base. Elytra brownish-yellow inclining to orange, closely mottled with blackish. Wings narrowly fuscous at the apex; reflection inclining to brownish-yellow; Sc almost to the apex, and R, pale, Sc at the apex, Rs, and M yellow-brown. Abdomen beneath with the long hairs on the middle keel and on the inner edge of the connexivum black in the male, pale brown in the female. Expanse 27–28 mm. . . *maculata* Fab.

What follows must be taken as referring to these forms generally, as no attention has been paid to their discrimination except where specially mentioned.

Ova. Leuckart's description is as follows: The brownish egg is rather slender, somewhat narrowed behind, flattened in front, and with an almost entirely even dorsal surface. The micropyle with its process is situated not quite at the anterior pole, but somewhat nearer the ventral surface. The chorion is strong and thick, especially on the ventral surface, and is composed of two superimposed and easily separable layers. The under of these, which bears the pigment, is of considerable thickness, especially dorsally, and is pierced with numerous fine but very distinct pores. Besides these pores, there is a beautiful and distinct network of areas separated by projecting lines. The upper layer shows essentially the same structure, especially on the dorsal surface, where it is scarcely to be distinguished from the under layer. But its appearance changes ventrally in consequence of the greatly increased height and breadth of the lines separating the individual areas, which therefore become deep pits. The bottom and sides of the pits are pierced by canals which pass through to the under layer of the chorion. In the circumference of the micropyle there is a clear area, out of the middle of which the process of the micropyle rises, which has a simple hair-like form, a little widened towards the end. The micropylar canal is rather broad, especially at the end, and its margins are tuberculated.

The egg of *N. halophila* is cylindrical, rounded at each end, and of a white colour.

For the purpose of oviposition, the insect attaches itself firmly by its fore and middle legs to a submerged stalk, buries its rostrum in the plant, as if to gain additional support, and makes an incision with the armed ovipositor. The work is executed by a backward and forward sawing motion, and occupies about a minute. Then the egg is passed into the incision, about one-third of its length remaining outside; the exposed extremity corresponds to the head of the future embryo (Régimbart). Enock exhibited to the Entomological Society of London eggs *in situ*, in a stem of *Alisma*, stating that "when ovipositing the ♀ invariably clasps the plant-stems in an inverted position—head downwards, the eggs being extruded and driven into the stem in the same relative position, so that on emerging the young dive down head foremost." Kirkaldy similarly exhibited eggs attached externally and basally to the stalk of *Anacharis*, by a glutinous substance; this was due probably to the absence of *Juncus* in the vessel in which they were kept. He adds: "That this basal fixation is not usual is evident from the fact that the ova are but feebly adherent, dropping off upon a slight disturbance, whereas the ova of the *Corixidae* (which are externally attached) are attached extremely firmly."

The eggs hatch in about fifteen days, and the embryo dives down head foremost on emerging (Kirkaldy).

Delcourt says that *maculata* does not lay its eggs in slits in plants, but free.

Larvae. *Notonecta* has at least five larval instars. In the ultimate and perhaps also the penultimate larval stage, the species, speaking generally, can always be determined by the structure of the head; in the first three, however, the shape of the head and eyes does not resemble the adult at all, but is more akin to that of *Corixa*, and the entire form of the insect in these stages is very different from that of the adult. The very young larvae are greenish-white, with red eyes.

With regard to the colour changes after the final instar in *glauca* and *marginata*, Kirkaldy says : "In both, the imago leaves the ultimate larval skin immaculate, dead-white in colour. In the course of development, the hemielytra become pure ivory white, while the scutellum early assumes a clear pale green colour, the golden-yellow pubescence being then noticeable. In *glauca* the hemielytra very gradually change to their normal hue, the scutellum remaining greenish somewhat longer. In *marginata*, the hemielytra pass through the yellowish-green stages, then becoming pale purplish-brown, and thence to the final bluish-black, the abdominis dorsum passing through very similar stages. The claval and corial fasciae, and the spots at the apical margin of the corium are ivory-white during the purplish-brown stage, the apical spots shortly turning yellowish, and during the final development the spots become castaneous, and the fasciae luteous."

Life-cycle. The imago is to be found all the year round. I have records for every month. The eggs hatch at the end of May, about a fortnight after they are laid. The larvae are found in the summer months, so that the new generation is produced at the end of July or beginning of August. Whittaker found *maculata in cop.* on January 14th, in a small pond near Winscombe, Somerset. According to Régimbart the hatching time tends in general to be towards the end of winter and the middle of spring, and rarely continues after the end of April. Copulation and oviposition take place chiefly in winter and spring, though they may occur in other parts of the year as well. Thus the ova may wait for many months before hatching. As the level of the water is subject to being lowered, they would find themselves if deposited externally, liable to exposure to the air with consequent desiccation ; the fact that they are concealed in a plant protects them and furnishes them with the moisture indispensable to their preservation.

Habitat, etc. This insect, the Water Boatman, occurs, usually in profusion, in stagnant ponds in which there is sufficient decaying organic matter to provide subsistence for the animals on which it preys. It swims by means of its hind legs, which are developed as oars, and are of course moved simultaneously. Its position in the water is habitually back downwards, and this very exceptional position may be accounted for as follows : "The body is velvety and overspread with a glistening air-film, which is conspicuous on the under-side, but elsewhere hidden by the wings. *Notonecta* is inflated with air to such an extent that it is very buoyant ; it has to cling to weeds or other fixed objects when it wishes to remain below, and as soon as it relaxes its hold, it rises to the surface. This uncommon buoyancy is probably connected with the peculiar attitude of the insect. The air is so lodged in and around its body as to make the ventral side the lighter, and this floats upwards. When it reaches the surface, the tips of the expanded oars and the tail press against the surface-film, and keep the head submerged. In this position the *Notonecta* breathes at ease, but is ready to make a sudden spring without suffering any delay from the difficulty of wetting its body. Now and then it swims back upwards for a few strokes, but soon assumes its ordinary position. . . . The hindermost abdominal spiracles, we might expect, would be large in *Notonecta*, considering that, when it reposes, only the extremity of the body is in contact with the air. In reality they are minute. Larger spiracles, well-defended with hairs to prevent the accidental entrance of water, are found on the sides of the thorax. To these the air is led by a singular passage. The side of the body which floats uppermost is keeled along the middle line. On each side of the keel, and between it and the lateral edge, runs a long row of elastic hairs, while a second and parallel row runs along the edge itself. These rows of hairs enclose a watertight covered way, leading to the thorax, and along it the air is guided to the large thoracic spiracles. Now and then one of the long oars is drawn over the abdomen, as if to urge the air more rapidly along the passage" (Schmidt-Schwedt).

Notonecta is a strictly carnivorous and very voracious insect, feeding upon other inhabitants of the pond. A specimen was found by Donisthorpe on Sutton Broad, June 9th, 1906, sucking the beetle *Donacia vulgaris*. According to Fabricius, it is "*piscibus molesta*." It falls itself, however, sometimes a prey to aquatic birds, for a bittern shot near Hull in November, 1893, contained entire bodies of this species in its stomach ("Nat.," Feb., 1894, p. 43). With its rostrum it can inflict a sharp and painful wound. It is said to make a noise like the word "chew," repeated three times running; the noise is produced apparently by rubbing the fore-legs together (Redfern).

Kirkaldy says: "Melanochroism and leucochroism are more marked in this genus than in any other of the Rhynchota with which I am acquainted." Also, "I have taken small examples of this insect in brackish water near Gravesend in company with marine Crustacea." These are probably *N. halophila* Edw. Parfitt also found it in brackish water as well as fresh. Kirkaldy adds further, "this species seems to be almost confined to stagnant water, though I have captured a single specimen in a running stream. This, however, appears to be unusual." It may be noted with regard to *N. halophila* that the peculiar shape of the pronotum, with its acute anterior angles, causes it to trench somewhat upon the area of the eye, producing a kind of separation into two parts, an anterior and a posterior, and this peculiarity enables the species easily to be recognised.

In the coupling of the sexes, the insects, while attached by the hinder extremity are placed side by side, the ♂ being a little lower than the ♀. In this position they swim about together with the same speed as when they are separated. It emits an odour which is apparently of a faecal nature; at least no openings similar to those in *Ilyocoris* have been found; it is very similar to that of the plant "stinking goosefoot" (*Chenopodium* *vulvarium*) (Kirkaldy). Like most other aquatic Hemiptera it is subject to the external parasitism of water-mites of the family *Hydrachnidae.* The larvae of these mites attach themselves to various parts of their host, even to the long hairs that fringe the abdomen; they are found only in spring.

From the ova of *Notonecta* Enock obtained the minute Hymenopteron *Prestwichia aquatica.*

Distribution. *Notonecta glauca, furcata* (*marginata*), and *maculata* inhabit the Palaearctic Region, both the European, African, and Asiatic parts of it, as well as parts of N. America. There is a form called *canariensis* Kirk, which occurs in the Canary Islands, and I have seen from Macedonia a form that is almost entirely black. As to Britain, the distribution of the different forms has not been much noted, and one cannot say much more than that *Notonecta*, speaking generally, is recorded from thirty-five English counties, the only exceptions being Westmorland, Salop, Hunts, Northants, and Monmouth. The Welsh records are from the counties of Carnarvon, Radnor, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland. *N. maculata* is recorded from Cumberland, Notts, Lincs, Norfolk, Warwick, Glo'ster, Middlesex, Essex, Surrey, Hants, Dorset, Devon, and Somerset; *furcata* from Cumberland, Yorks, Cheshire, Cambs, Suffolk, Essex, Middlesex, Surrey, Sussex, Hants, Wilts, Glo'ster, and Cornwall; and *halophila* from Kent, Sussex, Suffolk, and Cornwall.

432. **Plea minutissima** Fabr.

Fabr., E.S. iv, 59, 6 (1794); D. & S., B.H. 591 (1865); Saund., H.H.B.I. 330 (1892).

Ova. Wefelscheid found eggs in decaying stems and leaves of *Ranunculus aquatilis*, especially in the stems, where they were placed with the long axis parallel to that of the stem. The egg is of an irregular oval shape, strongly convex on one side and nearly flat on the other; the flatter side is tuberculated especially towards the micropyle, which is a little oblique projection at the anterior end; the tuberculations gradually lessen in size and number towards the convex surface, which is quite smooth.

Larvae. Last instar, 1½ mm. Head very broad, body tapering behind; fore parts pale ochreous, abdomen brownish ochreous; head rather short, with a brown cloud down centre, afterwards to become a distinct dark stripe; pro-, meso- and metanotum subequal; hind margins of wing-pads dark brown; under wing-pad projecting much beyond upper; legs ochreous, becoming darker towards tip, claws black; surface smooth and shining.

Life-cycle. The imago has been found from March to June, and in August and September, November and December. According to Wefelscheid mating begins in May and reaches its height in early June; copulation may last for two hours. The egg stage lasts for three or four weeks; there are five larval stages, and they last one and a half months, mainly during July and the first half of August. The insect passes the winter in the adult condition, and Wefelscheid maintains that there is only one brood per annum, though Kuhlgatz says two. In copulation the (smaller) ♂ takes up a position by the side of the (larger) ♀.

Habitat, etc. This little insect is found amongst aquatic vegetation such as *Lemna*, *Callitriche*, *Zannichellia*, etc., in ponds and ditches, always, I believe, in stagnant water. The posterior limbs are not natatorial, and the insect is slow in its movements, chiefly crawling about amongst the aquatic vegetation. Its food consists of small Entomostraca (Wefelscheid). Hungerford has made a similar remark about the American *P. striola*, adding, " the prey is grasped by the fore limbs, and the victim rolled about until the stylets [mandibular and maxillary setae] locate a vulnerable point." They can go for at least a week without their proper food, but after that Wefelscheid found that they had resort to the sap of the water plants. When it swims, it takes the inverted position, like *Notonecta*, and apparently for the same reason. Wefelscheid found on the mesosternum a pair of rasps which were used to produce a very feeble stridulation like the sound of a file. Wesenberg-Lund does not think it probable that either this or any other of the water-bugs passes the winter in mud, chiefly apparently because of breathing difficulties. But certainly *Corixae* do appear in the spring often smeared with mud.

Distribution. *P. minutissima* is distributed throughout Europe and in North Africa, Asia Minor, and Turkestan. In Britain it is recorded from eighteen English counties, viz. the coast counties from Norfolk to Glo'ster, and also from Northumberland, Yorks, Lancs, Cheshire, Oxon, Herts, and Surrey. The only Welsh record is from Glamorgan, and it is recorded from Ireland, but not from Scotland.

Family XVII. **CORIXIDAE.**

The *Corixidae* are a family of world-wide distribution, occurring everywhere in ponds, streams, lakes, canals, and rivers, and even in some cases in brackish water. One hundred Palaearctic species are enumerated in Oshanin's List, but as very little is known of those that inhabit the rest of the world, there are without doubt a very large number of species which still await collection and description before any adequate view can be obtained of the general distribution of the family. They are usually found in enormous numbers, and Girard records that in Mexico two species of *Corixa*, *C. mercenaria*, and *C. femorata* are so abundant that a kind of bread is made of their eggs ; the eggs are laid upon fascines introduced for the purpose, and are afterwards detached by beating. Howard says that the same two species form an article of commerce, being exported to England by the ton as food for song birds, poultry, and fish. Kirkaldy has computed that one ton contains 25,000,000 of these insects (Wallis). Puton makes the astounding statement that on one occasion in the year 1883, thousands of the insects fell from the air during a storm in Turkestan, coming down like rain in such enormous numbers as actually to extinguish a fire at a traveller's bivouac. A large flight was seen at St. Paul's, Minnesota, in the afternoon of October 11th, 1904, flying over asphalted streets which had just been watered. ("Can. Ent." 1905, p. 364.) At night they come readily to light, and I have received from S. India large numbers taken in this way.

The *Corixidae* are highly specialised insects, and many points in their anatomy are of great interest. For example, the head is of a most extraordinary shape; viewed from the front, its outline is somewhat pyriform, and its surface convex. Behind it is deeply excavated, so that in section it shows very little depth from front to back; it is in fact lenticular, with something of the shape of a meniscus. The posterior excavation fits over the front of the pronotum, to which the head is attached only at the small occipital foramen. The prothorax, again, consists of little more than a thin scale which overlaps the mesonotum in the same way as it is itself partly overlapped by the head. The only part visible in the normal position is the convexly triangular and more highly chitinised pronotal tergite, usually marked with black and yellow transverse stripes. This is free behind, but at the sides and the front it passes by a very distinct line of demarcation into a whitish or yellowish thinner scale, which in front fits accurately over the convex mesonotum, without being united to it, and at the sides runs out into a more or less truncated process, which forms the hinder boundary of the anterior coxal cavity, the rest of which is bounded by an inner prolongation of this same process. This arrangement brings the anterior coxae into close proximity with the hinder surface of the head. It will be seen that the very limited size of the area of attachment of the head to the prothorax, and of that to the mesothorax, gives to the head and prothorax considerable freedom of motion, especially in the vertical plane, and thus provides a means for the inclusion of air in these two spaces, which will serve for subaqueous breathing and render frequent visits to the surface unnecessary.

The eye is triangular, with its apex projecting far beyond the side of the head, so as to make the lateral margin an extremely sinuous curve. The apex of this triangle exactly overlaps a similarly shaped portion of the pleura of the prothorax, and thus the eye also is brought into close proximity to the anterior coxae. This elongation of the eye backward must have the effect of considerably extending the visual horizon.

The meso- and meta-thorax are much more completely attached to one another and do not present any special features, save that the scutellum is minute and is usually almost or quite covered by the pronotum. It will be noted that the natural position for the head is that it is so much bent under and backward that the apex of the clypeus is in contact with the first pair of coxae. In consequence there is no visible rostrum nor labial trough. The clypeus is transversely striated with a number of rounded ridges, and a little above its apex is a small opening out of which the mandibular and maxillary setae can be thrust; the end of the clypeus itself is provided with a tuft of long hairs which are doubtless tactile in function. The antennae are completely concealed, lying in a chink behind the eye, between the head and the pronotum.

The legs, again, afford very interesting features. In the front pair the tibiae are very short, and the tarsi, which consist of one large and broad joint, much larger than the tibiae, are always spoken of as "palae." This is a most useful organ for diagnostic purposes, as in the ♂ it differs greatly in shape and details according to the species. In the ♀ there is a general similarity, at least throughout the genus *Corixa*. The outline is externally convexly curved, and inwardly slightly concave; this margin is supplied with a fringe of long, strong, bristle-like hairs. This pair of limbs is used for manducatory purposes. "When in action they are brought rapidly and alternately to the rostrum; in inaction they hang downwards and inwards, their tips approaching each other; in swimming they lie backward along the sternum" (Buchanan White, 4). In sweeping through the water they appear to act in both sexes as sieves, collecting rubbish in the water and pressing it to the mouth. In spring they are often found much clogged with dirt as if they had been used for digging. "The middle pair of legs are used for standing on, the long claws clasping stones or plants, and the body of the animal remaining at some distance from the object rested on. The animal can also walk in a kind of way with these legs, its progress being at the same time assisted by short, jerking strokes of the hind legs through the water. When at rest and not clasping anything with the claws, the animal rises slowly to the surface of the water. The adult *Corixa* in swimming uses only the posterior legs; these legs are also used for cleaning the elytra, etc. In doing this, the animal uses one or both legs, brushing the pronotum, elytra, the under side of the hind body, and the long hairs at its end. To assist, perhaps, in this cleaning process, the inside of the hind tibiae and the base of the first joint of the hind tarsus are provided with what may be called comb- or rake-hairs; these are shorter and stiffer than the swimming hairs, and are widened and flattened at the extremity, being, in fact, somewhat oar-shaped, and truncate at the apex, which has fine, long teeth. These teeth are admirably adapted to rake out any particles of foreign matter which may have lodged in the fine rastration with which the pronotum and elytra of many species are sculptured; the species, however, which have no rastration (such as *Macrocorixa*) are, equally with the rastrate species, provided with rake hairs. These rake hairs are not present in the young" (Buchanan White, 4).

The insects swim in a series of jerks, back uppermost, and not inverted as *Notonecta* does.

Another very curious anatomical feature is the asymmetry which is to be found in the abdomen of the ♂. The right half of the abdominal segments in some species, and the left in others, are reduced in size, thereby causing a distortion and apparent twisting round of each whole segment and so of the abdomen, including the genital appendages. The purpose of this arrangement is unknown, but must probably be connected with the act of copulation. The ♂ genital apparatus in these insects consists of a more or less strongly chitinized capsule, of a somewhat pyriform shape, and placed with the rounded end forward. In the ordinary position it is completely concealed within the abdomen, from which, however, it can easily be dissected out. About half the length of the organ is almost cylindrical, and then the free edge of the cylinder runs out into two unequal processes, the shape of which varies according to the species. From this capsule arise the pair of so-called claspers, or genital styles, usually unlike in form and more or less differing according to species, so that here again we have a structure which may be used in combination with the palae for diagnosis in doubtful cases.

Another extraordinary structure exists in the ♂ of many species; it consists of a chitinous plate attached by a short pedicel to the upper side of the sixth segment of the abdomen, and is called the "strigil," from a fancied resemblance to the scraper used by the Greeks and Romans for the body in their bath. It is generally of a dead black colour as though painted with lamp-black, and is provided with rows of closely set teeth which are directed towards the mesial line of the body, and more or less overlap one another. It is situated on that side on which the asymmetry exists, but is not found in all species. In some species the rows of teeth are quite regular and in others more or less irregular, either in the distribution or the length of the teeth, and the size of the plate is not always commensurate with that of the insect. Dr. Buchanan White (3), who first called attention to these organs, considered them to have some connexion with the genital organs, but Dr. Handlirsch considers them to be stridulatory in function. The form of the strigil will be described subsequently under each species which possesses it.

Copulation takes place by the ♂ clinging to the back of the ♀ by means of the first two pairs of legs; the ♀ swims about with the ♂ in this position, and copulation lasts several hours. The eggs of most *Corixidae* are laid in the spring and the larvae are to be found only during the summer, from May to about the end of August. The ♀ begins to lay the day after copulation. In one instance some *Corixae* were provided with growing plants of *Hottonia*, and they deposited their eggs on these singly, in all positions, a short time elapsing between the successive depositions; sometimes as much as an hour passed without deposition, but of course the insects were not under entirely natural conditions. In depositing an egg, the ♀ grasps the leaflet or portion of the plant selected, with the first two pairs of legs, and then a longitudinal motion of the abdomen is observed, the tip resting on the spot where the egg will be laid. During this movement, the minute drop of fluid which affixes the egg to the plant is emitted and placed in the desired position; the egg is then laid with the micropyle farthest away from the point of attachment, and the ♀ swims away. Several days may be occupied by a single ♀ in laying her batch of eggs, the number deposited daily decreasing. The larvae are similar to the adult in shape, but the different species are not easy to separate, and they are still very imperfectly known.

Probably all the species of *Corixa* pass the winter in the perfect condition, and if they are not seen so numerously in ponds in the winter months as at other times, the explanation is that during the coldest weather they bury themselves in the mud at the bottom of the ponds; evidences of this are often seen in the spring, when their bodies are frequently more or less smeared with mud. Such retirement may, perhaps, be not altogether a question of temperature, for it must be remembered that an aquatic insect living in streams, or in any but the most shallow of ponds, is, in consequence of the more equable temperature of the element in which it lives, not subjected to such wide variations as a land insect. Moreover, *Corixae* do not seem to mind ice on the surface of the pond; Bueno has recorded how in Canada they may be seen swimming beneath the ice on warm days in winter. Any necessity that may exist for a winter subterranean retirement is therefore quite as likely as not to be a question of food supply.

Pairing takes place in spring and early summer and eggs are laid at once, the parents dying before the larvae have attained any great size. The perfect stage is reached towards the end of summer or in the autumn, the time differing according to the altitude at which the species is found. According to Buchanan White, however, *Micronecta* hibernates as a larva, and I have found larvae of this genus rather more than half-grown in May.

As to the nature of the food of the *Corixidae*, there is little definite information. Dr. Buchanan White has the following remarks: "I have not been able to make out satisfactorily of what the food of these insects consists (Westwood has described an Indian species, which is said to feed on the eggs of fish). They often rest on a stone, and seem to scrape its surface with the palae, which they bring rapidly and alternately to the mouth. In the same manner they scrape a root of *Lemna*, passing it rapidly between the palae. On examining a stone from which a *Corixa* had apparently been obtaining food, a small *Alga* and a few Rotifera and other animalcules were seen." I have repeatedly seen specimens which were kept in a glass containing pond water and pond weeds, gather up with their palae little bundles of the rubbish that gradually accumulates at the bottom of the vessel, and press them rapidly to the mouth, all the while keeping the palae in incessant motion. It is not possible, however, to see through the bundle and detect what is really taking place. Hungerford maintains that the *Corixidae* are in the main vegetarians, offering as evidence the appearance of *Spirogyra* after it has passed through their hands (i.e. palae) ; a large proportion of the chlorophyll granules is seen to have disappeared ; and again, the contents of the stomach on such occasions consist largely of chlorophyll granules.

" *Corixae* generally remain near the bottom of the water, and seldom come to the surface to breathe, as they can carry a large supply of air with them. Air is carried under the hind margins of the head and pronotum, in the marginal channel of the elytra, in the short channel between clavus and corium, on the sternum and underside of the hind body, and between the wings and upper surface of the hind body, being retained in the latter situation by the long hairs at the end of the hind body. I am not sure but that, in brushing the elytra with the hind-legs, they carry air from the channels of the elytra to the hind body " (Buchanan White). With all these numerous spaces filled with air, it is a wonder that the insect is not more buoyant ; it can remain at the bottom without clasping anything, and when still, rises only very slowly through the water. According to Régimbart, the larvae of *Corixidae* present at their exclusion from the egg, no trace of air on the ventral surface ; they are heavier than water and appear to commence taking in air only at the end of four or even six days.

In this country, these insects are not often seen on the wing, no doubt because they fly chiefly by night ; they come freely to light. Diurnal migrations have, however, occasionally been observed.

The *Corixidae* possess stridulatory power. The earliest notice of this seems to be in a paper read by R. Ball to the Zoological Section of the British Association at their meeting in Cambridge in the year 1845. Full particulars of these observations will be found below under *Corixa striata*, that being the species experimented upon. Similar observations were made later by Schmidt-Schwedt in the case of *Corixa geoffroyi*, and by Bryant in that of *Micronecta minutissima* ; and quite recently my friend Mr. G. E. Hutchinson has devoted some attention to the subject and has furnished me with details as to several other species, which will be mentioned in due course. The sounds reported by Ball are twofold, a chirping noise and a sound like that of grinding a knife ; the former is said to be produced by the rapid passage of the palae across the transverse ridges on the clypeus, and according to Prof. Handlirsch, the latter by rubbing the strigil against the underside of the hemielytra. Buchanan White thought that the strigil had some functional connexion with the genital organs, though this does not appear to have been more than a " pious opinion." But he points out that where the strigil is absent, the intromittent organ is furnished with many strong, recurved spines; these are present in other species, but not nearly so strongly developed.

In spring, various species of *Corixa* may be found to carry on different parts of the body, and often on the legs, and attached by a short pedicel the large globular or pear-shaped, blood-red larvae of *Hydrachnidae* or water-mites. I have found also a very small larva attached to the sternum without any pedicel, and showing a division of the body into two parts, the shape being something like that of a ♀ *Stylops*. This is probably how all these mites begin, and then the anterior division becomes ultimately the pedicel. Thus the terminal part of the life of the *Corixa* synchronises with the initial stages of that of the *Hydrachnidae*, these latter breaking away from their hosts when these are approaching the end of their life, and living the rest of their time as free individuals and not parasitic. When these parasites are numerous they must rather interfere with the movements of the host; but, apart from this inconvenience they can hardly be of much disservice when their attachment has been reduced to a mere pedicel, as the host probably then serves them merely as a basis of attachment, securing however, by its motions a continuous supply of oxygenated water for the helpless parasite, but not otherwise contributing to its well-being. The eggs of the *Hydrachnidae* are laid in spring in soft-stemmed aquatic plants, or on the under side of the leaves. The young larvae are pale red and six-legged, each leg again being composed of six segments.

The genus *Corixa* is divided into six subgenera, as follows:

(10)	1.	Pronotum with transverse lines	
(3)	2.	Large species, without rastration, asymmetry to the left in ♂ . .	*Macrocorixa*, 3 spp.
(2)	3.	Smaller species, more or less rastrate, asymmetry to the right in ♂	
(7)	4.	Pronotal central carina visible only in front	
(6)	5.	Basal joint of posterior tarsi not black at apex, ♂ with strigil . . .	*Corixa*, 16 spp.
(5)	6.	Basal joint of posterior tarsi black at apex, ♂ without strigil . . .	*Callicorixa*, 5 spp.
(4)	7.	Pronotal central carina distinct throughout	
(9)	8.	Intermediate tarsi shorter than tibiae	*Glaenocorixa*, 2 spp.
(8)	9.	Intermediate tarsi as long as tibiae .	*Oreinocorixa*, 1 sp.
(1)	10.	Pronotum without transverse lines .	*Cymatia*, 2 spp.

433. **Corixa geoffroyi** Leach (Macrocorixa id.).

Leach, Tr. Linn. Soc., xii, 17, 7 (1817); D. & S., B.H. 593 (1865); Saund., H.H.B.I. 333 (1892).

Ova. From the body of a ♀ I took on February 8th, 1913, twenty eggs.

They were of a yellowish colour, nearly globular, but acuminate at the distal end, which terminates in a blunt point, and with a small projecting circular ring-like disc at the proximal end, for attachment to subaquatic vegetation. The shape is very much that of a field turnip attached with the root outwards. The diameter of these ovarian eggs was not much more than half a millimetre, but they were probably not quite fully grown.

Larvae. The following description is taken from a micro-slide of a newly-hatched specimen, kindly lent me by Mr. Oscar Whittaker. As mounted for transmitted light it measured 2 mm. in length : the size in life would have been somewhat less. Body oval ; palae regularly arched outwardly, straight inwardly, an arched ridge running from apex to about $\frac{3}{4}$ of the inner edge from apex, a straight edge from this point to the apex, with about a dozen strong setae ; intermediate legs with tibiae much shorter than femora, and tarsus (one-jointed) longer than tibia, claws curved, a little longer than tarsus ; posterior legs with tibiae a little shorter than femora, one-jointed tarsus much longer than tibia, nearly twice as long, tapering towards apex where it is truncated and furnished with two strong, straight, unguiform setae, swimming hairs very fine and rather scanty, not in the least concealing the tarsus, tibiae with three rows of long hairs ; similar hairs on sides of body, and especially at apex, where they are very long ; two transverse patches on abdomen, posteriorly simply convexly curved, anteriorly with two convex curves meeting in middle ( ) ; these apparently represent the scent-glands.

A later instar, $2\frac{3}{4}$ mm. Of an ochreous colour, without markings, except blackish margins to the fore parts ; head similar to that of adult, disc-like, greatly hollowed behind, and attached to thorax only below ; prothorax extremely small and inconspicuous, almost hidden by the head, disc-like as in adult ; the meso- and meta-thorax seen from above form a large, nearly rectangular mass, slightly emarginate behind, with a margin of dense black hairs in front and at the sides ; the mesonotum occupies about one-third of this, and the metanotum is bounded in front by a deeply emarginate suture ; behind the metanotum a small and lenticular area fits into the posterior emargination ; sides of thorax with adpressed silvery hairs ; abdomen broader than thorax and with rounded sides, a blackish patch running down the middle, darkest on fourth and fifth segments ; legs similar to those of adult, but with two important differences, viz. that the posterior tarsi are only one-jointed, the terminal joint not yet being segmented off from the basal, and that the anterior limbs have only two segments after the trochanters, the first of which is the femur, and the second the combined tibia and pala, the segmentation of the latter off from the former not yet being effected ; thus the concave ridges on the latter joint, which are furnished with long setae, cease at the point where the pala will ultimately be separated from the tibia. The claws of the intermediate legs are longer than the tarsi.

The next instar, 4½ mm., is similar, but shows the beginnings of the wing-pads, and a trace of the suture which ultimately divides the pala from its tibia; the thick masses of short black hairs at the thoracic margins have disappeared and are represented by larger, outstanding, and less close blackish setae; the mesonotum also has grown at the expense of the metanotum.

The next instar measures 5–6 mm., and is similar, but with larger wing-pads, which have the sutures margined with black.

The penultimate instar, i.e. the last larval instar, measures 10 mm. and is much larger and broader than the others; the front tibiae are now quite distinct from the palae, though not yet freely jointed, and the mesonotum, wing-pads, and dorsum of the abdomen are thickly covered with blackish hairs; the wing-pads do not pass much beyond the intermediate legs.

Life-cycle. The imago may be found practically all the year round; I have definite records for every month except November; June is perhaps the month in which there are fewest specimens, as most of the over-wintered brood will by that time have died, while the new brood will not yet be mature. The eggs are laid in May by over-wintered examples; the larvae mature at the end of July or beginning of August, and the imagines continue to exist till the following spring, when they die before those of the succeeding brood are mature.

Habitat, etc. This species is usually abundant in ponds. They are, of course, subject to the risks of the drying up of the pond, but they do not seem to be at all in a hurry to leave. In one very dry summer I had the opportunity of seeing the great tenacity with which they clung to their comparatively small pond even when it was nearly dried up, and must, to judge from the contents of the net, have been most inconveniently crowded. The ♂ has a strigil, which is situated on the left side, and is attached to the hind margin of the sixth dorsal segment; it is elongate oval, with the long axis, which is placed in the direction of the length of the body, much greater than the short one, 8 mm. by .36 mm. Its upper surface consists of nine rows of extremely fine chitinous rods, placed close together like the teeth of a very fine comb; the rows are parallel to one another, and to the long axis of the strigil, and each row slightly overlaps the base of the one in front of it, the teeth all being directed towards the median line of the body. The longest of these rows contain about 200 teeth each, and there cannot be less than about 1500 altogether. Buchanan White, who first called attention to this peculiar organ, states that it contains 10 rows of teeth, but Handlirsch gives 9, and this agrees with my own observations. The whole organ is of a dull black colour.

Handlirsch considers that the function of the strigil is stridulatory, and that by being rubbed against a small fold on the underside of the margin of the elytron, which exists on the left side and not on the right, it produces the second, or knife-grinding sound referred to in our introductory notes to the family. It has been noticed that the abdomen is moved slightly from side to side during the production of this sound. It is further noteworthy that in the ♂ the right hemielytron overlies the left where they cross, and therefore the latter is brought down closer to the body than the former, and so the necessary contact with the strigil is secured. That this is normally the relative position of the two hemielytra, and not merely accidental in the examined specimen, is shown by the fact that the marbled markings of the membrane are much fainter in the left elytron than the right, and in fact are in some parts quite obliterated, as might be expected in a part which is kept constantly covered. If the above is the true explanation of the knife-grinding sound, that sound can be produced by the ♂ only, and is likely, therefore, to be of the nature of a love-call.

I do not know that the production of these sounds has actually been observed in *C. geoffroyi*, but this species was probably selected by Handlirsch as the largest in the genus, and therefore the easiest in which to study these minute structures; and moreover, as the structure is similar in this species to what obtains in those in which stridulation has actually been observed, it seems justifiable to assume a similarity of function.

The other apparatus which Handlirsch regards as stridulatory is the pala taken in conjunction with the striae on the clypeus, though in this instance also the remarks in the preceding paragraph apply. The palae of the ♂ have on their inner surface four more or less distinct ridges running almost the entire length of the organ, all carrying some kind of appendages. The first is on the outer edge, and carries a row of 15 or 16 long and strongly curved bristles; below this, and starting at the base about half-way across the disc, but terminating outwardly at the same point as the outer ridge, is a second, very feeble ridge, carrying, not bristles, but a row of about 24 stout, conical objects which Kirkaldy has named "pegs"; below this is a strong ridge carrying a closely set row of some 30 short and straight bristles; and below this again, and forming the inner boundary of the pala, is another ridge, the space between them being hollowed; this last ridge carries about 20 very long and very strong, nearly straight bristles which are flexible, each tapering to a fine point. The two outermost rows of bristles form the net which encloses the mass of matter brought to the mouth for the insect to obtain its nutriment therefrom; with regard to the other two, the short bristles and the pegs, the suggestion is that these, and especially the latter, by being drawn rapidly across the six transverse ridges on the clypeus produce the chirping sound referred to in our introductory notes.

There are still three other organs in the ♂ fore leg, of which no quite satisfactory explanation is at present forthcoming, viz. a strong spine on the outer angle of the distal end of the tibia, a closely placed, comb-like set of five bristles on the inner angle of the same, and what looks like a stridulatory area on the inner side of the femur, where there are a number of little point-like projections. The first of these does not exist in the ♀.

The pala of the ♀ shows many differences ; it is more acuminate than that of the ♂, which indeed is almost truncated at the end, and it carries only three ridges with appendages, the row of pegs being absent. The others are similar to those of the ♂, except that the outermost bristles are shorter, nearly straight, and do not project so much. The clypeal ridges are as plainly present in the ♀ as in the ♂, but as the pegs are absent in the former, it might be expected, if these are the chief organs concerned with producing the chirping, that that sound would be far less distinct in the ♀ than in the ♂. Many more observations of the insects in a state of nature are needed, however, before any of these questions can be considered as settled.

In this connexion, it may be noted that sound travels four times as fast in water as in air, and that, therefore, even feeble sounds such as these must certainly be , would more readily be picked up at a distance than would be the case with insects that live on land.

Distribution. This is a common species throughout Europe and extends its area into N. Africa, Central Asia, and the northern parts of the Oriental Province. In Britain it is included in almost all the county lists, being recorded from thirty-two English counties, i.e. all except Westmorland, Derby, Salop, Hunts, Beds, Worcester, Oxon, and Monmouth ; the Welsh records are from Carmarthen and Glamorgan, and it is found in both Scotland and Ireland.

434. **Corixa affinis** Leach (Macrocorixa id.) (C. atomaria Saund.).

Under this name are confused two species, *C. panzeri* Fieb. and *C. affinis* Leach. These were kept distinct by Fieber, Douglas and Scott, Buchanan White, and Saunders in his " Synopsis " (" Trs. Ent. Soc.," Lond., 1876). Subsequently (1892) they were united by Saunders in his " Hemiptera-Heteroptera of the British Islands," under the name *C. atomaria* Fieb. He gives no reason for this, but it may possibly have been in deference to the opinion of Dr. Puton, who had said in his " Synopsis " that he could not appreciate the points of difference mentioned by these authors, and who united them in his Catalogue (1899). Oshanin followed Puton in this respect. But later researches seem to leave no doubt as to their distinctness. Most of the external characters seem to me to be perfectly distinguishable, and the examination of the ♂ genitalia shows two quite distinct forms, as

Mr. H. Britten has pointed out. The differences may be tabulated as follows :

434a. *C. panzeri* Fieb.	434b. *C. affinis* Leach.
1. Length, 10½ mm.	1. Length, 8–9 mm.
2. Colour usually darker, black lines thicker than yellow.	2. Colour usually paler, black lines thinner than yellow.
3. Pronotum shorter, lines fewer.	3. Pronotum longer, lines more numerous.
4. ♂ pala with outer margin more curved, apex broader, surface more hollow and scoop-like.	4. ♂ pala with outer margin straighter, apex narrower, surface less hollow.
5. ♂ genital capsule larger and broader.	5. ♂ genital capsule smaller and narrower.
6. Intermediate tarsi longer, as compared with tibiae.	6. Intermediate tarsi shorter, as compared with tibiae.
7. Face of ♂ with larger and deeper depression.	7. Face of ♂ with smaller and shallower depression.

434a. **Corixa panzeri** Fieb. (C. affinis pars Osh. Cat.).

Fieber, Sp. Gen. Cor. 15, 3 (1851); D. & S., B.H. 594 (1865); Saund., Syn. ("Tr. Ent. Soc.," 1876, 646).

Ova and **Larvae.** Not described.

Life-cycle. The imago has been taken from March to May, and in October.

Habitat, etc. This is an inhabitant of ponds and ditches, and is sometimes found in brackish water. According to Hutchinson, it is also partial to ponds in chalk-pits and gypsum pits, i.e. to water containing salts in solution. Superficially and in the field it might be mistaken for *C. geoffroyi*, but hardly for *C. affinis*, because of its darker colour. When we have a number of each of the three species placed side by side, they are easily separable by size and colour. The relative length of the intermediate claws referred to by Saunders in his " Synopsis " does not seem to hold good.

The strigil is on the left side and is similar in shape to that of *C. geoffroyi*, but has only six rows of teeth, with the beginning of a seventh, and the teeth are much longer than in *C. geoffroyi*, so that the rows are broader and the teeth more easily seen. The ♂ has a deep facial depression, much deeper than in *C. geoffroyi*. The pala of the ♂ is outwardly more curved, so that it becomes broader at the apex instead of nearly parallel-sided as in *C. geoffroyi*, and the apex is less truncate. The row of pegs is placed nearer the outer margin, and the pegs are more numerous, upwards of thirty, and placed closer together.

Mr. G. E. Hutchinson has observed this species stridulating. It occurred at all times of day, but mostly in the evening, when the electric light was on. The palae are held below the head, slightly more forward than when at rest; the femora lie against the head behind and below the eye, and the palae are turned inwards towards each other so that they lie in a transverse line. They are moved towards and away from each other very rapidly, perhaps six or seven times a second; a corresponding movement of the femora occurs and is believed to result in the stridulatory area of the femora being rubbed on the side of the head; but he did not think that the palae ever touched either the head or one another. Before, between, and after periods of stridulation there is usually an antero-posterior alternate motion of the front legs, and a very faint sound may then be produced. The sound is very like that made by a *Corixa* hitting its head rapidly against the side of the containing jar, but of course far more rapid and regular. Stridulation usually took place when the insect was anchored to *Chara*, etc.

Distribution. This species is not with us a common insect, and on the Continent it is rather southern in distribution. Owing to the confusion which has existed between this species and the next, it is impossible to give the exact British distribution, but it has certainly been taken in Essex, Kent, Sussex, Surrey, Cambs, Herts, Cheshire, Lancs, and the Orkney Islands, in which latter it was captured by Reuter. Probably some of the other records refer also to this species. There are no Welsh records.

434b. **Corixa affinis** Leach (C. affinis pars. Osh. Cat.).

Leach, "Trs. Lin. Soc.," xii, 18, 8 (1817); D. & S., B.H. 595 (1865); Saund., Syn. ("Trs. Ent. Soc.," 1876, 646).

Ova and **Larvae.** Not described.

Life-cycle. The imago has been taken in April, July, and August. The life-cycle is probably similar to that of *C. geoffroyi*, but the insect is far less known.

Habitat, etc. Like the preceding, this species inhabits ponds, and in my own experience chiefly near the sea, and often in brackish waters.

The strigil is on the left side, and is almost identical with that of *C. panzeri*, having six rows of broad but finer teeth. The facial depression of the ♂ is not so deep as that of *C. panzeri*, nor does it extend as far. The ♂ genital capsule is much narrower and paler, and the appendages are differently shaped. The pala of the ♂ has the outer margin less curved and the apex more truncated. The smaller size and usually paler colour of this species are sufficient to separate it in the field from *C. panzeri* and *a fortiori* from *C. geoffroyi*.

It is curious that the non-rastrate character of these insects is associated with an asymmetry to the left, and the strigil on the left side, while with the succeeding species, which are more or less rastrate, the asymmetry and strigil are both on the right, a correlation of parts which must have some explanation, if only one could find out what it is.

Distribution. *C. affinis* is generally distributed on the Continent, and with us it is less rare than *C. panzeri*, though apparently local. The exact distribution cannot be stated, for the same reason as with *C. panzeri*; it has certainly occurred in Kent, Sussex, and Hants. There are no records from Wales.

Besides the localities given above for these two insects, there are also records applying to one or other, or to both of them, as follows: Northumberland, Staffs, Notts, Lincs, Norfolk, Suffolk, Dorset, Somerset, Devon, Cornwall and the Scilly Is., Scotland and Ireland.

435. **Corixa lugubris** Fieb.

Fieb. Syn. Coris., No. 6 (1848); D. & S., B.H. 596 (1865); Saund., H.H.B.I. 334 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from March to September.

Habitat, etc. This species is specially addicted to stagnant ponds, including those in which the water is brackish; it would be found also in dykes on marsh land. The strigil is on the right side; it is minute and entirely different from those of the sub-genus *Macrocorixa*. The pedicel of attachment runs along the hind margin of the sixth segment, to which it adheres; this has the effect of bringing the strigil to the outer margin of the connexivum, instead of in the hollow adjoining its inner margin. The strigil is at the end of the pedicel, and is placed vertically, so that it projects above the general level of the abdomen. It consists of one single comb, with about thirty long teeth, set very close together and pointing straight upwards. Its colour, including the pedicel, is black.

The pala of the ♂ has the usual four ridges, but the hairs on the outermost, which is abruptly arched near the base, are short and inconspicuous; the pegs on the second ridge begin at the inner angle of the tibia, rise in a high arch in the centre, and decline again to join the outer ridge near the apex; they are small and numerous, over thirty in number and set rather close together; the hairs of the third ridge are small and fine, and those of the fourth, though considerably longer, are not nearly so long and strong in proportion as those of the preceding sub-genus. There is no spine or other appendage at the apex of the tibia. From this species onwards the hairs on the outer margin of the pala are so inconspicuous that they will not be further referred to. It will be noticed that, in the figures given, only the pegs are inserted.

Where this insect occurs, it is extremely common, having little competition from other species of the genus. Its chief competitor would be *C. selecta*, but I have found that in the dykes of salt-marshes in which *lugubris* is present, *selecta* is absent, and vice versa, though both species may occur, and often do, on the same marshes. It flourishes in such dykes, however stale and stagnant the water may be. In very foul water it is very subject to the attacks of the *Hydrachnidae*, more so, in fact, than I have found to be the case with any other species. I have specimens taken in the dykes on the marshes between Rye and the sea, where the water was particularly foul, in which the legs are very much encumbered with these parasites. One specimen, a ♂, has two on the left fore-leg, one on the tibia, and one of the pala, one on each of the intermediate tibiae, and two on the right posterior tibia, these latter being particularly large and occupying almost the entire length of the tibia. Those attached to the fore limbs are always on the outer margin, otherwise one cannot but believe that they would intolerably interfere with the taking of food.

Distribution. This species is distributed throughout Europe, and in Algeria and the Canary Is. In Britain it has been recorded from seventeen English counties, viz. Cumberland, Durham, Yorks, Lancs, Cheshire, Norfolk, Suffolk, Cambs, Warwick, Essex, Kent, Surrey, Sussex, Dorset, Devon, Somerset, and Cornwall; the Welsh records are from the counties of Carnarvon, Merioneth, and Glamorgan, and it is recorded from Scotland, but not from Ireland.

436. **Corixa selecta** Fieb.

Fieb. Syn. Coris. (1848); Edwards, E.M.M. xxx, p. 102.

As no description of this species is given in Saunders' "Hemiptera-Heteroptera of the British Islands," I append Mr. Edwards' summary of the differences between *C. selecta* and *C. lugubris*, as given in "Ent. Mo. Mag.," xxx, p. 102. "In the ♂ of *selecta* Fieb., there is a strong transverse keel on the forehead at about one-third of the height of the inner margin of the eye (when viewed from in front), bounded above by a rather deep impression; the entire frons below the keel is excavated, the excavation reaching from eye to eye. In the male of *lugubris* Fieb. there is a feeble transverse keel on the frons on a level with the lower margin of the eyes (when viewed from in front), bounded above by a large shallow impression; the excavation on the frons is feeble. The best character for separating the females of these two species lies in the middle keel on the front of the pronotum, which in *selecta* is nearly half as long as the pronotum, and in *lugubris* is not more than one-fourth as long as the pronotum." In other respects the two species are much alike, except that *selecta* is rather smaller than *lugubris*.

Ova. Undescribed.

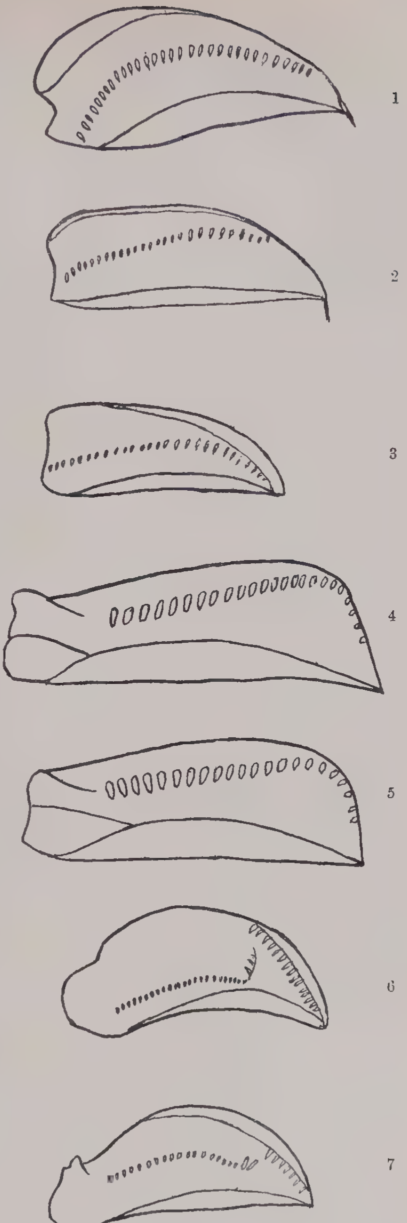
Larvae. Last instar, 3¾ mm. Yellowish-brown, with the head, thorax, including wing-pads, a broad median band to the abdomen, the anterior margins of the abdominal segments, and the connexivum, smoky brown; mesonotum and outer wing-pads strongly pilose; all other parts of the usual type. In these larval *Corixae*, the antennae are proportionately larger and much more conspicuous than in the adult, often projecting laterally beneath the wing-pads, instead of being stowed away between the head and pronotum.

Life-cycle. The imago has been taken in March, April, and August, those taken in the latter month being the new brood of the year; some of these are still larval in August.

Habitat, etc. This insect seems to be confined to brackish waters on the coast, where its only competitor is *C. lugubris* (q.v.). The strigil is on the right side and is very small and insignificant, and the details of its structure are not easy to make out.

The pala of the ♂ is smaller and has the outer edge more evenly curved than *C. lugubris*. The line of pegs starts from a little more than half-way across the pala, and runs nearly straight to a little beyond the middle of the outer edge, just before reaching which it turns and is continued very near to the margin, which it soon joins. There are about twenty-four teeth, the middle ones of which are larger than the rest, and also larger than usual for an insect of this size. The next ridge is very strong in its basal half and runs parallel to the line of pegs in this part; it then curves up a little and suddenly breaks off, being continued at a lower level. The hairs it carries are quite short, but those towards the tip of the pala are much stouter. The innermost row of hairs are fine and not very long. The tibia has a strong ridge down the middle of the upper surface.

Distribution. Very little seems to be known of *C. selecta* outside our own country. It is recorded from Germany, Spain, Austria, and Hungary. In Britain, also, it has not yet been observed very widely; it is recorded from five counties, Durham, Norfolk, Kent, Sussex, and Hants, in all cases



PALAE OF ♂ CORIXAE

1. *C. lugubris* Fieb.
2. *C. selecta* Fieb.
3. *C. hieroglyphica* Duf.
4. *C. sahlbergi* Fieb.
5. *C. linnaei* Fieb.
6. *C. limitata* Fieb.
7. *C. venusta* D. & S.

on salt marshes. There are no records from either Wales, Scotland, or Ireland. Where it does occur it is extremely abundant. Probably it is often passed over as *lugubris*.

437. **Corixa hieroglyphica** Duf.

Duf. Rech., 86, 2, figs. 25–87 (1833); D. & S., B.H. 598 (1865); Saund., H.H.B.I. 334 (1892).

Ova. Elongate oval and pointed anteriorly: figured by Dufour.

Larvae. An intermediate instar, 2½ mm. Of a pale yellowish colour with a dark central band to the abdomen, and covered with a short blackish pubescence, which on the anterior margin of the mesonotum and the sutures of the wing-pads is coarser and deep black. The claws of the intermediate legs are much shorter than in larvae of the same length in *C. geoffroyi*, and the presence of wing-pads also distinguishes it at this stage; otherwise the description of the young larva of that species would almost apply to this.

Last instar, 3½–4 mm. Similar to the above, but with claws of intermediate legs longer, and legs tinged with greenish, when freshly disclosed.

Life-cycle. The imago is to be found practically all the year round. I have records for all months except February, November, and December. The larvae mature in August.

Habitat, etc. This species inhabits ponds, and may be found in those attached to farm-yards, even when they are much contaminated with stable refuse. It also occurs in brackish water (Morley, 4). It may usually be distinguished superficially by its very pale colour. The fine black lines on pronotum, and the partial absence of rastration, combined with the irregularity of the markings on the clavus, come in as confirmation.

The strigil is on the right side. It is very small and consists of four rows of teeth, two long ones in the centre, and a very short one above and below these. The pala of the ♂ is evenly curved outwardly; the row of pegs begins about half-way across the base of the pala, and is continued sloping gently towards the outer margin for about two-thirds of its length, and then turns rather abruptly downwards to meet the outer margin near the tip; there are about twenty-eight large pegs placed near together; the next ridge is prominent through half its course and then sinks to the level; its hairs are fine and of moderate length; the innermost, i.e. marginal, row consists of about twenty rather long and stiff bristles. The tibia has a crest along the middle of its upper surface. The forehead is prominent, standing far out in front of the eyes, and the facial excavation is deep and is terminated above in the form of an arch.

Distribution. This species occupies a very wide area; it occurs throughout the whole of the Palaearctic Region, and is found also in the Ethiopic, Oriental, and Nearctic Regions. It is very common in Britain, being recorded from twenty-five English counties, viz. all the coast counties from Yorks to Glo'ster, together with Northumberland, Cumberland, Lancs, Cheshire, Notts, Cambs, Warwick, Hereford, Oxon, Bucks, Herts, and Surrey; the only Welsh record is from Glamorgan; it is reported from Scotland, but not from Ireland.

438. **Corixa sahlbergi** Fieb.

Fieb. Syn. Coris., No. 10 (1848); D. & S., B.H. 600 (1865); Saund., H.H.B.I. 335 (1892).

Ova. The egg is of the usual globular shape, terminating distally in a blunt point, and proximally in a circular disc; it is pale yellowish in colour, becoming somewhat darker towards the point.

Larvae. Undescribed.

Life-cycle. The imago is to be found practically all the year round. I have records for every month except February and October. The above egg was laid in April.

Habitat, etc. This insect occurs in ponds and in dykes on marsh land. The strigil is on the right side, and is large, elongate, and oblong with rounded ends; it carries from six to nine irregular rows of teeth, only one of which, the innermost, traverses the whole length of the organ; it is nearly three times as long as broad.

The pala of the ♂ is truncated at the apex and gradually increases in width from the base outwards. It has a subtriangular process at the base towards the outer margin. The row of pegs, about twenty-four in number, begins near the base at about one-third of the distance across the pala, and runs in a perfectly straight line to the bend in the margin which forms the truncation, when it turns abruptly and runs almost concurrently with the margin itself to very near the tip. The next ridge has an angular bend near the base, but otherwise runs regularly and carries fine hairs which do not pass beyond the inner margin of the pala; the inner margin itself carries a row of about twenty-four stout hairs which are about as long as the greatest width of the pala. The tibia has a short ridge on the upper side.

The frontal impression of the ♂ is distinct, and is terminated in a wide arch at about the level of the lower end of the eyes.

This species can be easily distinguished from *C. linnaei* by the clear space at the end of the corium, where it adjoins the membrane, and by the longer pronotum; the less degree of truncation in the ♂ pala will confirm that sex.

Distribution. It is of European distribution and is also common in Britain. It is recorded from twenty-seven English counties, viz. all the coast counties from Northumberland to Glo'ster, together with Cumberland, Lancs, Staffs, Notts, Cambs, Warwick, Hereford, Bucks, Herts, Middlesex, Surrey, and Berks; the Welsh records are from Merioneth, Glamorgan, and a doubtful one from Radnor; it is found in both Scotland and Ireland.

439. **Corixa linnaei** Fieb.

Fieb. Syn. Coris., No. 11 (1848) ; D. & S., B.H. 601 (1865) ; Saund., H.H.B.I. 335 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago may be found practically all the year round. I have records for every month except February.

Habitat, etc. This species occurs in similar situations to *C. sahlbergi*, viz. ponds and dykes in marsh lands.

The strigil is on the right side ; it is oblong with rounded ends, and is about three and a half times as long as wide ; it carries five rather irregular rows of teeth, of which the two innermost are entire.

The pala of the ♂ is so much like that of *C. sahlbergi* that no separate description is necessary ; the chief difference is that the pegs are a little larger and the truncation more abrupt. The tibia also is similar.

The facial impression is so shallow as to be scarcely noticeable. The genital capsule is very small, but the claspers are long.

Distribution. Like *C. sahlbergi*, this species is of European distribution, and it occurs also in Syria and Siberia, but it does not appear to be quite so widely distributed in Britain. It is recorded from twenty-one English counties, viz. the coast counties from Northumberland to Hants, except Durham, and again from Cumberland, Lancs, Staffs, Derby, Notts, Cambs, Warwick, Hereford, Glo'ster, Surrey, Berks, and Somerset ; the Welsh records are from Carnarvon and Glamorgan, and it is found in both Scotland and Ireland.

440. **Corixa limitata** Fieb.

Fieb. Bull. S.N. Mosc., ii, 528 (1848) ; Saund., H.H.B.I. 336 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been taken in March, April, May, July, August, October, and November. The larvae mature in August.

Habitat, etc. This species inhabits ponds.

The strigil is on the right side and is small, triangular, with sides slightly rounded, and carries five rows of teeth.

The pala of the ♂ is short, with the outer surface very convex and the inner very concave, so that the organ is more spoon-like than usual ; the outer margin is strongly arcuate. The row of pegs is divided into two parts ; one of these proceeds from the base, starting at about two-thirds of the distance across the pala, and is continued in a straight line down the length of the pala for about two-thirds of the distance ; there it suddenly stops, to be continued along the outer margin, for about the last third of its length, to the tip ; between these two lines of pegs there is a scattered group of very minute ones occupying the space from the end of the first line to the beginning of the second. The next ridge, as seen from above, lies almost over the inner margin, and its hairs therefore partly overlap the longer ones that line the inner margin. The tibiae are strongly curved.

The facial depression is very marked and terminates in a high arch which runs up some distance between the eyes.

I have found a ♀ specimen in April with two larval Hydrachnids attached, one to the inside of the right intermediate tibia, and the other to the outside of the corresponding posterior tibia.

Distribution. This species is of European distribution and also extends its area into Siberia and N. America; it is also widely distributed in our own country, though not usually common. It is recorded from sixteen English counties, viz. the coast counties from Lincs to Devon, together with Cumberland, Lancs, Cambs, Hereford, Glo'ster, Surrey, and Berks. The Welsh records are from Merioneth and Glamorgan. There are none from either Scotland or Ireland.

441. **Corixa semistriata** Fieb.

Fieb. Syn. Coris., No. 26 (1848); D. & S., B.H. 602 (1865); Saund., H.H.B.I. 337 (1392)

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from April to October, and also in January.

Habitat, etc. This species also inhabits ponds.

The strigil is on the right side.

The pala of the ♂ is very like that of *C. limitata*, the chief difference being that the line of pegs is continuous, the part occupied by the scattered group of small pegs in *C. limitata* being here represented by a continuous curved line of pegs of the usual size, joining the basal with the apical part of the line; there are also a few scattered pegs below the apical part. The tibia also is similarly curved.

The facial depression is similar to that of *C. limitata*, but with the terminal arch less rounded.

Distribution. This also is an insect of European distribution, extending also into Algeria and Siberia, but it is less common with us than *C. limitata*. It has, however, been recorded from seventeen English counties, viz. the coast counties from Norfolk to Somerset, except Dorset, and also from Northumberland, Cumberland, Yorks, Lancs, Cheshire, Leicester, Cambs, and Hereford; it is not recorded from Wales, but has occurred in both Scotland and Ireland.

442. **Corixa venusta** D. & S.

D. & S., E.M.M., v. 265 (1869); Saund., H.H.B.I. 337 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from March to September, and in December. The insect matures about the beginning of August, and evidently hibernates as imago.

Habitat, etc. This species inhabits running water in streams, keeping near the banks.

The strigil is on the right side. It is subquadrate in shape and carries five rather irregular rows of teeth.

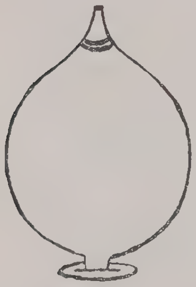
The pala of the ♂ has the outer margin arcuate, but not so much so as in the two preceding species. The row of pegs is divided into two parts, the first running from about the middle of the base of the pala in a straight line to the middle of the disc, and then curving towards the inner margin for about a half of the remaining space, when it stops, and is continued at a higher level, just within the anterior margin almost to the apex. The first part contains about fifteen pegs, and the second about seven. The other two ridges are very like those of the two preceding species. The tibia also is similarly curved.

Distribution. According to both Puton's and Oshanin's Catalogues, this insect has been found, outside the limits of the British Isles, only in France. In Britain it has not occurred very widely, although it is found in profusion where it does occur. It is recorded from twelve English counties, viz. Northumberland, Cumberland, Yorks, Lancs, Norfolk, Suffolk, Cambs, Surrey, Sussex, Hants, Devon, and Cornwall. The Welsh records are from Merioneth, Carmarthen, and Glamorgan, and it has been found in both Scotland and Ireland.

443. **Corixa striata** Linn.

Lin., F.S. 904 (1761); D. & S., B.H. 606 (1865); Saund., H.H.B.I. 335 (1892).

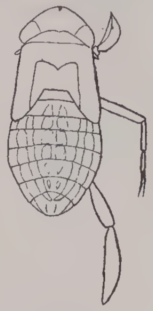
Ova. The eggs are of the same type as those of *C. geoffroyi*, but smaller and less globose. They have the usual disc proximally and acumination distally, and the whole outline is somewhat elliptical. They are yellowish, a little darkened towards the apex, which is itself pure white; in one specimen which was laid in captivity on *Myriophyllum*, this white point is surrounded at its base with a narrow black ring. The yellow colour is produced by the contents, for in the empty egg the chorion is colourless. The surface is smooth, but under high magnification shows a minute alutaceous network. The egg hatches by a rupture at the acumination, and after the exit of the embryo the chorion round the opening is seen to be divided into several triangular flaps which curve gracefully outwards and form a sort of crown, giving the whole egg-shell a most elegant urn-like shape, which reminds one of the capsules of certain mosses. In some cases, the splitting goes further, and the whole chorion is sometimes divided at least half-way down, the division seeming to run along a previously prepared line, and so showing a perfectly even edge.



Egg of *Corixa striata* L.

Leuckart, speaking of *C. striata* and *C. nigrolineata*, says: "The chorion is colourless, comparatively strong and thick, but almost structureless, especially in *C. striata*, in which is to be found here and there a slight depression and the weak outlines of a reticulation on the upper surface, especially anteriorly.

Larvae. A late instar, probably the last larval, measures 5 mm. in length. It is of the usual shape, yellow, with the fore parts more or less smoky brown, and the abdomen with six longitudinal bands of dark brown; two of these constitute the connexivum, the two sides passing into one another at the apex; two others form a double band down the centre, separated from one another by a very thin yellow line in the centre; they are also more or less broken up by the rather paler base of each segment into a series of six more or less quadrate spots on each side; the other pair of dark bands lie between this central band and the connexivum, and rather nearer the former than the latter; the anterior part of the mesonotum and the outer wing-pad are covered with long, black hairs, and the wing-pads themselves are black-margined; the basal abdominal segment has a broad black band at the apex. As usual, the small and disc-like pronotum is entirely hidden by the head.



Nymph of
Corixa striata L.

1st instar. Length 1 mm. for the newly hatched bug. White, with abdomen very slightly ochreous; head, with face pale fuscous, eyes black; thorax, all three segments with two dark fuscous longitudinal bars, margins slightly infuscated, hind margin of metanotum broadly black; abdomen with central fuscous fascia with a more or less pale centre, margins rather broadly infuscated; legs pale, more or less infuscated in parts; claws of intermediate legs very long. It will thus be seen that at the very beginning the foundation is laid of that system of markings that characterises the fully grown larva, and one can only expect that this system becomes more and more plain in each successive instar.

Life-cycle. The imago is to be found all the year round; I have records for every month; one of these, for December, by P. de la Garde, states that both sexes were present. Most of the larvae mature by August, but some may still be found in September. Ball observed eggs deposited in June on *Utricularia*, which hatched in about eighteen days; some which I received from Mr. G. E. Hutchinson on June 14th, hatched at the end of June and the beginning of July.

Habitat, etc. This insect frequents running waters, and is abundant in streams, canals, etc. But it is also found in ponds, though, I believe, not so commonly as in running water. Morley (4) speaks of its being rarely found in brackish water. It is noteworthy as being the first in which the practice of stridulation was noticed. In the Reports of the British Association for the year 1845, the first short notice of this is given by R. Ball. The record is as follows: "Some specimens of *C. striata* were found at Glasnevin on 27th April, 1840; they were kept alive in a hand basin for six weeks, and as a noise was frequently heard, watch was kept, with the result that one was seen to 'stretch its hind legs straight out from its body and remain quite still, resting with its middle legs on a bit of *Utricularia* at the bottom of the basin; it then moved the fore legs rapidly in front of its head and gave three brisk little chirps; very often after the chirps it made a noise something like grinding a knife, only very much fainter and softer; while doing so it moved its body rapidly from side to side, still keeping the hind legs stretched out. It very often made the chirps alone, but not the grinding noise, I think, without the chirps, either before or after (mostly before). The sound may often be heard during the day; the evening seems its favourite time, and frequently during the stillness of night, just before the day begins to break.' The months of May and June were considered to be the most favourable. The noise was often maintained for some time, but was uncertain in its occurrence, and easily interrupted by the slightest external noise. The stimulus of a candle-light set it chirping merrily. 'The longest time that both noises lasted was while twenty was counted very fast.' The sounds were much fainter when produced in autumn than in spring and early summer."

The same observer records that "when one of the *Corixae* died, it was speedily sucked out by one of its companions."

The strigil is large, elongate, sub-reniform, sinuate, with about fifteen irregular and greatly overlapping rows of teeth (B. White, 3). It is placed longitudinally on the right side of the insect.

The pala of the ♂ is strong and stout, gently convex outwardly and almost straight inwardly. The first row of pegs is situated a little below the outer margin, and consists of about twenty, which occupy rather more than the outer half of the length of the pala; the second row is situated a little more than half-way across the pala and contains about fourteen pegs, running from the base to a position a little below the inner end of the first row. The third ridge is occupied by a closely set row of bristle-like hairs, which, beginning at the base below the second row of pegs, passes round nearly parallel to the outer margin to the tip of the pala. The inner margin has the usual row of long hairs.

This species is very subject to the attacks of *Hydrachnid* parasites, which are attached to both legs and body. One of my specimens has one at the left shoulder, and another, a very large one, on the right side of the body under the wings and a little in front of the strigil, which it partly overlaps.

Distribution. *C. striata* is distributed throughout the Palaearctic Region and also in the Nearctic; it is also quite general in the British Islands. It is recorded from thirty-one English counties, the only omissions being

Westmorland, Staffs, Salop, Leicester, Hunts, Beds, Northants, Worcester, and Monmouth. The Welsh records are from Carnarvon, Carmarthen, and Glamorgan, and it is found in both Scotland and Ireland.

444. **Corixa distincta** Fieb.

Fieb. Syn. Coris., No. 19 (1848); D. & S., B.H. 608 (1865); Saund., H.H.B.I. 335 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from March to October, and in December. As with the other species, the insects of the year mature about August.

Habitat, etc. This species is found in ponds and also in company with *C. striata*, but is not nearly so common.

The strigil is very different from that of *C. striata.* It is small, subquadrate, and with only five rows of teeth (B. White, 3). It is situated on the right side.

The pala of the ♂ also is quite different from that of *C. striata.* It is thin and hollowed on the upper or inner surface, with a sharp and more strongly curved outer margin, which is highest very near the base. The general outline is semioval. The first row of pegs is short and consists of about fourteen rather large ones placed very close together towards the tip of the pala, where it coalesces with the margin. The second row is far from this, almost on the inner margin, leaving a perfectly clear disc to the pala; it runs in a straight line, gradually approaching the inner margin and consists of about sixteen small pegs, placed close together and gradually diminishing in size till about the middle of the pala they fade away into the third line which runs from apex to base with the usual small hairs. The inner margin carries the usual long hairs.

Distribution. It is distributed throughout Europe and in Siberia, but in the British Isles it is not recorded from so large an area as *C. striata.* It has been found in twenty English counties, including the coast counties from Lincs to Somerset, together with Northumberland, Cumberland, Lancs, Salop, Notts, Cambs, Middlesex, Surrey, and Berks; the Welsh records are from Carnarvon and Glamorgan, and it is found in both Scotland and Ireland.

445. **Corixa fallenii** Fieb.

Fieb. Syn. Coris., No. 18 (1848); D. & S., B.H. 607 (1865); Saund., H.H.B.I. 336 (1892).

Ova. Undescribed.

Larvae. I have two larvae which, I believe, belong to this species, but I cannot be quite sure. They are in a late instar, probably the last, and are almost undistinguishable from those of *C. striata*, except that they are throughout of a lighter colour. This difference was more marked in life. The middle row of abdominal markings is darkest and forms an almost continuous stripe. The other markings are rather indistinct.

Life-cycle. The imago is found practically all the year round, and I have records for every month except November. The insects of the year mature about August, which probably means egg-laying in May or early June.

Habitat, etc. This species occurs in the same way as the preceding two and with them, being in some places even more abundant than *C. striata*.

The strigil is minute, narrowly pyriform, with four rows of teeth (B. White, 3), and is situated on the right side.

The pala of the ♂ is quite unlike that of any other species, and is one of its most reliable characteristics. It is thin and concave above as in *C. distincta*, but is larger and abruptly truncate at the base, where its diameter greatly exceeds that of the tibia, being in fact more than twice as great. The outer margin runs nearly straight for more than half its length and then gently curves to the apex ; the inner margin is nearly straight. The first row of pegs consists of about half a dozen very minute ones close to the margin beyond the middle. The second row contains about thirty small pegs, which, starting from very near the inner margin at the base, run diagonally across the disc towards the first row, which, however, they do not quite reach. The third ridge runs parallel and very near to the inner margin, and carries a long series of short hairs ; the inner margin itself is furnished with the usual long hairs.

This species also is subject to the attacks of Hydrachnid parasites, but apparently not so much as *C. striata*. I have found them only on the underside.

Distribution. It is found throughout Europe and Siberia, and also in Algeria. In Britain it is almost as widely distributed as *C. striata*, being recorded from twenty-six English counties, including the coast counties from Northumberland to Glo'ster except Durham, and from Cumberland, Lancs, Cheshire, Notts, Cambs, Warwick, Hereford, Oxon, Bucks, Herts, Middlesex, and Surrey ; there are Welsh records from the counties of Carmarthen and Glamorgan, and it is found both in Scotland and in Ireland.

446. **Corixa moesta** Fieb.

Fieb. Syn. Coris., No. 23 (1848) ; D. & S., B.H. 610 (1865) ; Saund., H.H.B.I. 336 (1892).

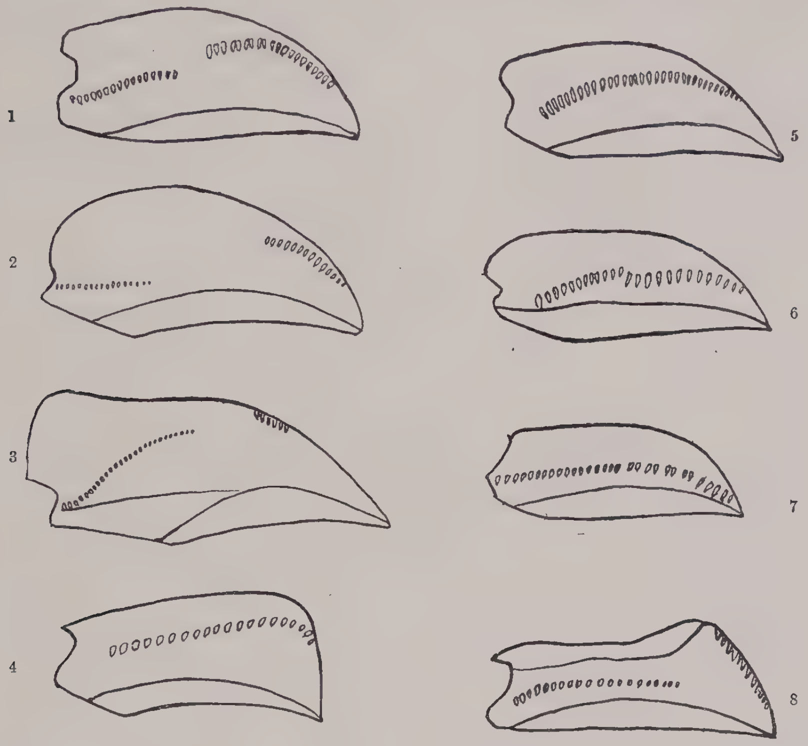
Ova and **Larvae.** Undescribed.

Life-cycle. The imago may be found practically all the year round, and I have records for every month except October. No other information is at present available.

Habitat, etc. This little species is an inhabitant of ponds, and when these are in peaty soil, or contain much decaying vegetable matter, the insect is more or less of a deep brownish colour, showing its markings even more feebly than usual.

The strigil is oval, with five or six rather irregular rows of teeth, and notwithstanding the small size of the insect, it is much larger than the last two described ; it is situated on the right side.

The pala of the ♂ is very marked. It reverts to the type of *C. linnaei*, only of course on a smaller scale. It is truncated at the apex, and gradually increases in width from the base outwards. The row of pegs, about twenty in number, begins near the base, almost half-way across the limb, and runs in a perfectly straight line towards the bend in the margin which forms the truncation, where it bends and coalesces with the margin. The next ridge runs nearly parallel to this, starting from the inner margin near the base, and carries no pegs, but merely short hairs. The inner margin, which is nearly straight to the tip, carries the usual set of long hairs.



PALAE OF ♂ CORIXAE

1. *C. striata* L.
2. *C. distincta* Fieb.
3. *C. fallenii* Fieb.
4. *C. moesta* Fieb.
5. *C. fossarum* Leach.
6. *C. scotti* Scott.
7. *C. nigrolineata* Fieb.
8. *C. praeusta* Fieb.

Distribution. It occurs all over Europe, and is widely distributed in the British Isles. It is recorded from twenty-six English counties, including all the coast counties from Northumberland to Glo'ster except Durham, together with Cumberland, Lancs, Cheshire, Derby, Cambs, Warwick, Worcester, Hereford, Oxon, Surrey, Berks, and Wilts. The only Welsh records are from Carnarvon and Radnor, but it is found in both Scotland and Ireland.

447. **Corixa fossarum** Leach.

Leach, Tr. Lin. Soc., xii, 17, 4 (1817); D. & S., B.H. 611 (1865); Saund., H.H.B.I. 338 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. This insect is found in the adult condition all the year round, and I have records for every month. Beyond this, however, I have at present no evidence as to the course of development.

Habitat, etc. This is another inhabitant of ponds. The six thick black lines on the pronotum make its recognition easy amongst the rastrate species.

The strigil is very small; it is pyriform, with six rows of teeth, of which the sixth is very short (B. White, 3). The dorsal surface of the abdominal segment preceding this is also strongly transversely striate.

The pala of the ♂ is of a semioval shape, slightly truncate at the base, and broadest in the middle. A row of some sixteen pegs runs diagonally along a ridge from nearly the middle of the base to a little beyond the middle of the outer margin; the disc on each side of this is concave, and the inner concavity is bounded by another ridge carrying hairs, and parallel, and very near to this is the inner margin with the usual fringe of long hairs.

C. fossarum is another of the species that are attacked by Hydrachnid parasites. These sometimes attach themselves in most awkward positions, as, e.g. on the posterior tibia, which is the chief swimming organ.

Distribution. This insect is of Northern and Central European distribution, and it occurs also in Spain and Siberia; it is, moreover, one of those species that have passed into the New World and found a home there. It occurs widely in Britain, being recorded from twenty-three English counties, viz. the coast counties from Northumberland to Glo'ster, except Kent, and from Cumberland, Lancs, Cheshire, Staffs, Cambs, Warwick, Herts, Middlesex, and Surrey. The Welsh records are from Carnarvon, Merioneth, and Glamorgan, and it is found in both Scotland and Ireland. *C. prominula* Thoms. is now regarded as a var. of this species. It has been found in the Isle of Harris of the outer Hebrides.

448. **Corixa saundersi** Kirk.

Kirk., E.M.M., xxxv, 2.

I am including this insect in our list, although I have great doubt as to whether it is really distinct from the very variable *C. nigrolineata* Fieb. Nothing seems to be known of it beyond what Kirkaldy originally described. His account is here appended: Pronotum, clavus, and basal half of corium rastrate, the rest of the corium rather feebly rastrate. Width of pronotum half greater than length, lateral angles irregularly rounded. Intermediate tibiae and claws subequal, each about $\frac{3}{8}$ longer than tarsus. Metaxyphus very short, triangular, subequilateral.

Pronotum and elytra brownish-black; pronotum with 7–8 fairly straight, rather narrow, yellow lines (occasionally splitting); lines at base of clavus entire, somewhat dilated; lines of corium and membrane, and those towards apex of clavus, undulated and interrupted, *not* continuously divided by dark, regular, longitudinal areas; corio-membranal suture not very distinct, not margined with pale yellow; meso- and meta-sternum and basal three or four segments of abdomen blackish. Length, 5 mm.

♂. Frontal fovea elongate ovoid, rather narrow and shallow, oval at base, extending a little posteriorly beyond apical margins of eyes. Pala cultrate, dorsum arcuate, not produced backwards, base rather broader than apex of tibia; concave side with a slightly arcuate row of about twenty blunt rounded teeth. Strigil very large, oblong oval, length twice as great as breadth, composed of four (? five) irregular, sinuately margined rows of striae.

♀. Pala apparently not distinguishable from that of *fossarum* ♀. Chobham (June). 3 ♂, 1 ♀, E. Saunders.

C. saundersi is said to differ from *nigrolineata* is being much more feebly rastrate on corium, and by the form of the metaxyphus; it differs from *fossarum* by the longer pronotum and greater number of pronotal transverse lines, and by the form of the metaxyphus. As regards ♂♂, *saundersi* is separable from *nigrolineata* by the form of the strigil and of the frontal fovea, and from *fossarum* by the form of the strigil and of the palae; It is, moreover, a much smaller insect than the latter, one example barely reaching 5 mm., while *fossarum* is rarely, if ever, under 6, and often attains 6½.

Distribution. This species has not yet been discovered anywhere else than at Chobham, Surrey, where the original specimens were found.

449. **Corixa scotti** Scott.

D. & S., E.M.M., iv, 271; Saund., H.H.B.I. 338 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been taken in January, from March to June, and in August and September. In August some specimens were only just mature.

Habitat, etc. This little insect inhabits ponds and ditches.

The strigil is pyriform and with five rows of teeth (B. White, 3), and is situated on the right side.

The pala of the ♂ is semioval, with the base slightly truncate; the outer margin is at first abruptly curved, then straight for a space, and then gently arcuate to the apex; the row of pegs is situated a little before the middle, and runs at first nearly straight towards the outer margin, then showing a break near the middle and thence gently curving to the outer margin; the pegs are about twenty-five in number, very small at the base, but larger in the outer part. The next ridge with its short hairs is sinuate and nearly parallel to the slightly sinuate inner margin.

The number of yellow lines on the pronotum is usually said to be five, but there is often present a sixth, more or less fully developed, but even then there is not much difficulty in distinguishing it from *fossarum*, as it is a smaller and narrower insect, with a shorter pronotum, and of course the pala in the ♂, as well as the nature of the facial depression, enables that sex to be easily recognised.

Distribution. Outside of Britain, *C. scotti* is recorded only from France. In the British Isles, its distribution seems to be very restricted. It is recorded from nine English counties, viz. Cumberland, Westmorland, Yorks, Lancs, Cheshire, Hants, Dorset, Devon, and Cornwall. I have taken it in Carnarvonshire, in the Snowdon district, and it has been found in both Scotland and Ireland.

450. **Corixa nigrolineata** Fieb. (C. fabricii Osh. Cat.).

Fieb. Syn. Coris., No. 24 (1848); D. & S., B.H. 605 (1865); Saund., H.H.B.I. 337 (1892) (C. fabricii).

Ova. Buchanan White (4) thus describes these: "They were laid about April 24th, and were then shortly pyriform, attached at the broader end; the free end narrower and nipple-shaped, with a projecting point from the nipple. In colour they were yellowish-white and opaque, the surface very delicately hexagonally reticulated, with the reticulation firmly impressed. They were attached singly, or two or three together, to plants, etc. On May 5th, the annulus round the nipple had become fuscous, and the egg generally darker, except the nipple, which remained light. On May 7th, the shape of the egg appeared to be less pyriform and more ovate; at about one-third the length of the egg from the apex appeared on each side the eye of the enclosed embryo as a reddish-brown spot, not sharply defined and somewhat curved wedge-shaped, and made up of hexagonal cells; in the annulus were six dark lines, radiating from the centre of the nipple. On May 10th, the egg was generally darker, and the eye-spots larger and darker. About May 13th, some of the eggs were hatched; the apex split along the dark radiating lines, and the six teeth thus formed rolled somewhat back and each nearly divided into two or three lesser teeth."

Larvae. The young *Corixa*, when newly hatched, is delicate white in colour and semi-transparent, the eyes alone being reddish-brown; it soon, however, becomes darker in colour, and banded with grey. The first pair of legs are much the same as in the adult, with rows of cilia and a single claw; the second pair are as in the adult, the one-jointed tarsus being provided with two long claws ; the third pair as in the adult, but the tarsus with one joint only with two claws and *simple* hairs. Inside the legs the muscular fibres may be seen constantly twitching, for what purpose I know not, unless it be in connexion with the circulation. The habits of the young *Corixa* are much the same as those of the adult (B. White, 4).

A later instar, probably the last, is as follows : Shape as usual ; colour a uniform greyish-brown with margins of thorax inclining to orange ; abdomen with a central longitudinal black patch through the second, third, and fourth segments ; wing-pads edged inwardly and apically with black, the usual black hairs in front and at the sides of the mesonotum ; legs yellowish, claws of intermediate legs much longer than tarsi.

Life-cycle. The imago has been found in January, and from March to October, and the insects of the year mature in August. As above indicated, eggs laid in the last week of April hatched at the end of the second week of May ; these would probably mature by the end of July or beginning of August, and the insects thus produced would prolong their life in some cases till the following July.

Habitat, etc. This, again, is an inhabitant of ponds chiefly, but several of the Scottish examples were taken in streams. The strigil is oval, almost circular, with about six rather broad rows of teeth, three of which are rather irregular (B. White, 3), and is placed on the right side.

The pala of the ♂ is very simple, gently arcuate on the outer margin, and almost straight on the inner. The row of about twenty-six to twenty-eight pegs runs nearly straight from nearly the base to the outer margin a little before the apex, where it suddenly bends and coalesces with the margin itself ; here the pegs are larger ; the next ridge with its short hairs is gently arcuate and runs from base to apex ; the inner margin has the usual fringe of long hairs.

The five species described by Douglas and Scott in 1869, the names of which are now regarded as synonyms for this species, were based upon a few specimens, in most cases a single ♂, taken by Dr. Buchanan White in Scotland, three of them from the Island of Bute, and one, the darkest, *borealis*, from the Shetlands. It is much to be desired that the streams and lakes of Scotland should be much more fully worked than has hitherto been done ; other species, or at least melanic forms, might be discovered.

Distribution. *C. nigrolineata* is distributed over Europe, and in the British Islands in one of the commonest of the genus. It has been recorded from twenty-nine counties, i.e. all except Westmorland, Staffs, Leicester, Rutland, Hunts, Beds, Northants, Salop, Oxon, Berks, and Monmouth. From Wales the records are from Carnarvon, Radnor, and Glamorgan, and it is found in both Scotland and Ireland.

451. **Corixa boldi** D. & S. (Callicorixa id. Osh. Cat.).

D. & S., E.M.M., vi, 245 (1870); Saund., H.H.B.I. 339 (1892).

Of this insect one can only say that the unique specimen is probably a freak, as no other has been seen since the original was taken in August by Mr. Bold, in Northumberland. It is probably an aberrant form of *C. praeusta*, and the original specimen, according to Kirkaldy, is preserved in the Newcastle Museum.

452. **Corixa praeusta** Fieb. and var. **wollastoni** D. & S. (Callicorixa id. Osh. Cat.).

Fieb. Bull. S.N. Mosc., ii, 521 (1848); Saund., H.H.B.I. 339 (1892).

Ova. Undescribed.

Larvae. Last instar, 5 mm. Shape as usual; entirely brownish-yellow, lighter or darker, with orange markings to the mesonotum, and an indefinite black patch in the centre of the abdomen; the whole surface pilose with rather long adpressed yellowish hairs; some much longer hairs down the margins of the abdomen, at first one to each segment, afterwards more numerous; legs yellowish-brown; the one-jointed hind tarsus shows no trace of the black patch on its underside which is so important a feature in the adult. So far as I have been able to make out, the fore limbs show no trace of a division between the tibia and tarsus. There are the usual black hairs over all the margins of the mesonotum.

Life-cycle. On Snowdon, about half-way up, I found the above larvae in August, and the majority of the adults had only just completed their final change, and were still soft and yellow, looking very weird as they sped through the dark peaty water, for they were able to swim quite readily although their chitin was in so teneral a state. Probably at a lower level the species would have been a little earlier. The imago has been found from February to September.

Habitat, etc. This species is found both in the running water of canals and streams, and in ponds, especially the latter, and Morley (4) records it from brackish water. There is no strigil, but the aedeagus is furnished with strong recurved spines; such spines are present in other species, but in the *praeusta* group (i.e. the genus *Callicorixa*) they attain a much greater development (B. White, 3).

The pala of the ♂ is very striking in form and needs to be viewed in several aspects before its shape can be properly grasped. First of all the tibia is strongly curved and has a strong black ridge running down its outer edge. The pala itself is something like that of *C. sahlbergi* and *linnaei*, broadening from base to apex, but not so abruptly truncated, the straight upper margin passing into the truncated end by a bold curve, which also is blackened. On the apical margin is a row of about thirteen to fifteen pegs. The central row of pegs passes from the middle of the base, running in a gently arcuate line, till it nearly meets the ridge of hairs about a third of the distance from the apex ; these hairs are rather longer than usual ; the straight inner edge has the usual fringe of long hairs.

Although there is no strigil, *C. praeusta* is able to stridulate, producing both kinds of sound.

Bold (2) found the var. *wollastoni* flying to light. He says : " While reading with my window open on account of the heat, on the 27th August last, about 9 p.m., when quite dark, I was considerably surprised by a ♀ of *Corixa wollastoni* flying to my light, around which it flew as madly as any moth, " flopping " down on the table and rising again so quickly that I had considerable difficulty in capturing it. When between my finger and thumb, it emitted an odour quite similar to that of the bed-bug, but less powerful and persistent, only clinging to my digits for a few minutes."

Distribution. It is found throughout Northern and Central Europe and in Northern Turkestan and Siberia ; it occurs also in North America. In the British Isles it can hardly be called one of the commoner species, though possibly it may sometimes be passed over as another species such as *C. linnaei*. It is recorded from sixteen English counties, viz. Northumberland, Cumberland, Yorks, Lancs, Cheshire, Lincs, Norfolk, Suffolk, Warwick, Glo'ster, Herts, Middlesex, Essex, Kent, Surrey, and Hants ; the Welsh records are from the counties of Carnarvon and Glamorgan, and it is found in both Scotland and Ireland.

453. **Corixa sodalis** D. & S. (Callicorixa id. Osh. Cat.).

D. & S., E.M.M., vi, 245 (1870) ; Saund., H.H.B.I. 339 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. There is no information save that the adult has been taken in September.

Habitat, etc. The ♂ has no strigil.

Distribution. Outside of Britain it is recorded only from Scandinavia, North Finland, and Northern and Central Russia. In Britain it is recorded only from Northumberland.

454. **Corixa caledonica** Kirk. (Callicorixa id. Osh. Cat.).

Kirk. Ann. Mag. N.H., vi, 20, 156 (1897) ; Saund., H.H.B.I. 340 (1892) (cognata).

Ova and **Larvae.** Undescribed.

Life-cycle. There is no farther information than that the imago has been taken in August and September.

Habitat, etc. The ♂ has no strigil. The fore tibia of the ♂ is not curved like that of *C. praeusta*, but has a ridge on the outer edge, which appears as a delicate black line ; the pala is much like that of *C. praeusta*, without the black markings ; its outer margin is straight for two-thirds of the distance, and then curved to the apex ; the row of about eighteen pegs runs from the base near the inner margin, nearly straight for about two-thirds of the length of the pala, and then suddenly stops, and a little row of about eight appears actually on the outer margin very near the apex. The row of hairs is very near the pegs, almost parallel to them, and stops a little beyond them. The inner margin has the usual fringe of long hairs.

Distribution. This insect is recorded from Britain only, and here the only definite records are from Scotland, where it extends into the Shetlands. I have seen a ♂ sent me from Cumberland by Mr. F. Day, which may perhaps be this species; but the pala does not quite agree with the only authentic specimen I have, and seems to be intermediate between this and *C. praeusta*.

455. **Corixa concinna** Fieb. (Callicorixa id. Osh. Cat.).

Fieb. Syn. Coris., No. 15 (1848); D. & S., B.H. 604 (1865); Saund., H.H.B.I. 340 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found from March to May, and in October.

Habitat, etc. This species appears to be found chiefly in ditches and ponds, on salt marshes, or otherwise near the coast. The ♂ has no strigil. The pala of the ♀ differs a good deal from those of previous species, being long and narrow and ending in a long pointed claw. That of the ♂ is said by Kirkaldy (11) to be cultrate, with about forty pegs, blunt and suboval basally, gradually elongating towards the apex.

Distribution. *C. concinna* is spread over Europe, and extends its area into Turkestan, Siberia, and Northern Mongolia. In Britain it is by no means common; it has been recorded from nine English counties only, viz. Lancs, Cheshire, Lincs, Norfolk, Essex, Kent, Surrey, Sussex, and Dorset; the only Welsh record is from Glamorgan, and it has been found in Scotland, but not in Ireland.

Under the name *C. carinata* in Saunders' "Hemiptera-Heteroptera of the British Islands" are included two species, viz. *C. carinata* Sahl. (=*cognata* Fieb. =*sharpi* D. & S.) and *C. germari* Fieb. (=*variegata* Wallengr. =*intricata* D. & S.). These were kept separate in Saunders' "Synopsis," ("Tr. Ent. Soc.," 1876), and there can be little doubt that they are distinct. They may be distinguished as follows:

C. carinata.	*C. germari.*
1. Length, 8½–9 mm.	1. Length, 7½–8 mm.
2. Colour usually darker, markings indistinct.	2. Colour paler, markings distinct.
3. Strigil with eight rows of teeth.	3. Strigil with sixteen rows of teeth.
4. Pala of ♂ thin, with pegs beyond middle irregular.	4. Pala of ♂ stouter, with pegs more regular.
5. Pronotum longer.	5. Pronotum shorter, generally with [fewer lines.
6. Frontal fovea of ♂ extending almost to base of frons.	6. Frontal fovea of ♂ extending but little beyond apical margin of eyes.

456. **Corixa carinata** Sahlb. (subg. Glaenocorixa Saund.).

Sahlb. Not. Finn., 12 (1819); Saund., H.H.B.I. 340 pars. (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found in April, May, July, August, and September. Some of these records may, however, refer to *C. germari.*

Habitat, etc. This is chiefly a northern species. The strigil is somewhat circular, and has eight broad rows of teeth (B. White, 3).

The pala of the ♂ has a curious twist about a third of the way along its length, and is thin and usually pale in colour. According to Kirkaldy, it has, starting from the base, fifteen or sixteen rather blunt pegs somewhat cramped together, then one solitary blunt peg, then five together, though further from each other than the fifteen or sixteen are from each other, then twelve or thirteen elongate, tapering, somewhat curved pegs continuing almost to the apex of the pala. That of the ♀ is similar to that of *C. concinna*, and ends in a long claw.

Distribution. This insect occurs chiefly in Northern Europe. In Britain it has occurred mainly in Scotland; there are records from six English counties, viz. Westmorland, Yorks, Staffs, Lincs, Surrey, and Hants, and one Welsh, viz. Glamorgan. It is recorded also (doubtfully) from Ireland.

457. **Corixa germari** Fieb.

Fieb. Bull. S.N. Mosc., ii, 531 (1848); Kirk. Ent. xxxi, 249.

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been taken in April and September.

Habitat, etc. This also is mainly a northern species. The strigil is somewhat circular, and has about sixteen rather narrow and very irregular rows of teeth; this feature easily separates it from *C. carinata.*

The pala of the ♂ is, according to Kirkaldy (4), rather less twisted and rather more pointed apically than that of *C. carinata*, otherwise the shape is very similar to what obtains in that species. The difference of arrangement of the pegs is pretty easily seen; there are about forty all close together, extending over the same distance as in *C. carinata*, and more uniform in shape and irregular in arrangement. The pala also is a stouter organ than in *C. carinata*, and is generally darker in colour.

In both these species the pronotal lines are very much broken up, especially in the middle, and it is almost impossible to determine their exact number, but *C. germari*, with its shorter pronotum, has usually a smaller number.

Distribution. Outside of Britain this species is recorded only from France, Germany, and the northern parts of N. America. In Britain its exact distribution is not easy to determine, as the localities are probably mixed with those of *C. carinata.* But it appears to have occurred at any rate in Cambs, Staffs, and Westmorland, and in both Scotland and Ireland. It is found as far north as the Shetlands (Reut.).

458. **Corixa cavifrons** Thoms. (Glaenocorisa id. Osh. Cat. ; subg. Oreinocorixa Saund.).

Thoms. Opusc. Ent., i, 39 (1869) ; Saund., H.H.B.I. 341 (1892).

This is a most puzzling insect. Until quite recently it was supposed to be purely a Scottish and mountain species, flourishing in the tarns and streams of the Highlands. But Mr. G. E. Hutchinson has been very successful in taking it, not only in suitable Scottish waters, but in several English counties as well, even including the flats of Cambs. The insect exists in at least two forms which, at first sight, would be taken for distinct species. One of these is what is described in Saunders' "Hem.-Het. Br. Is.," though some slight alteration is needed in that description to remove a possible misconception ; not only the pronotum, but the clavus (entirely) and the corium (in its narrow basal part only) are all very coarsely rastrate, while the rastration of the latter part of the hemielytra rapidly lessens as its width increases till at its apex, before joining the membrane it is quite smooth and polished. In this form the legs are more or less black, and the whole insect might be described as black with a few scattered faint yellow markings. The other form is narrower and smaller in both sexes, and has a light yellow basic colour on which the black markings of pronotum and hemielytra stand out very distinctly ; its legs also are yellow, and it might be described as yellow with distinct black markings. This form does not appear to have been known to Saunders. I have examined these two forms most carefully, and have been forced to the conclusion that they are merely local varieties of the same species, the dark one from the lochs and tarns of Scotland, and the other from ponds and ditches in several English shires. A form which is to some extent intermediate between these, with something of the bulky shape of the dark Scot, but much also of the clear markings of the Southron, has been taken by Mr. Hutchinson in the Isle of Jura. The black and yellow lines are pretty much horizontal and parallel to one another except in the anterior part of the clavus, where they are somewhat oblique ; the parallel and oblique sets are partially separated by a small black blotch. The strigil is small and subquadrate, with four or five rows of teeth, one of which is irregular. There does not seem to be any appreciable difference in the genital capsules of the two forms, nor in the palae of the ♂ except in colour and perhaps the degree of rigidity of the chitin. The outstanding and rounded eyes are equally prominent in both forms. The hind tarsi are slightly longer in the Scottish form.

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found in January, February, July, and September.

Habitat, etc. As already intimated, the large dark form inhabits the lochs and tarns of Scotland, and it is much to be desired that a still fuller investigation of the immense numbers of these in the Highlands should be carried on for many months at a stretch. It would need abundance of leisure and considerable powers of endurance, but the results would probably be commensurate, not only amongst the *Corixidae*, but in the rest of the Cryptocerata as well. The paler and smaller form inhabits ponds and ditches in some of the counties of England, as below, and there seems good reason to suppose that suitable investigations might considerably increase this list, and perhaps throw some light on the relation between the two forms. There does not seem to be any information yet available as to the food of this species, which must surely be different in the two forms.

The pala of the ♂ is thus described by Saunders: "Subtriangular, with a marginated concave enlargement at upper margin." This gives it some slight resemblance to that of *C. fallenii*, but it is not so deep as in that species. The margins of the concave enlargement are often more or less darkly coloured, especially in the Scottish form. The pala of the ♀ is similar to that of each of the three preceding species, but even longer and narrower, and with a longer claw.

Distribution. Outside the British area, this species is recorded from the north-eastern and the mountainous central parts of Europe, and from Greece. In the British Isles, there are first the counties of Hants, Cambs, and Westmorland for the pale form, and then various parts of the Highlands of Scotland for the dark one. Mr. Hutchinson has met with it commonly in the Isle of Islay, in the Inner Hebrides. In Jura, the form is intermediate between the light and the dark one. At Ben Chearan, Invernesshire, it was found in a little tarn on the summit at a height of 2000 feet, and in company with the water beetle, *Dytiscus lapponum.*

459. **Corixa bonsdorffi** Sahlb. (Cymatia id. Osh. Cat.).

Sahlb. Not. Fenn., 13, 6 (1819); D. & S., B.H. 613 (1865); Saund., H.H.B.I. 341 (1892).

Ova. According to Hutchinson the eggs are pedunculate like those of *C. coleoptrata* (q.v.). This peculiarity in the eggs of these two species, added to their other differences from the rest of the *Corixae*, confirms the belief I have long held that, as was formerly done, and as is still done in the latest Palaearctic Catalogue, *Cymatia* should be regarded as a separate genus, and not as a mere sub-genus of *Corixa.*

Larvae. Undescribed.

Life-cycle. The imago has been taken in January and February, May and June, August, September and October, and in December. It clearly hibernates as imago.

Habitat, etc. It inhabits ponds.

Apparently this species has no strigil. The pala of the ♂ is elongate, sub-cylindric, terminating in a powerful curved claw (Kirkaldy, 11). It would seem that the ♀ is far commoner than the ♂.

Distribution. This insect occurs throughout Europe, and in Siberia.

In Britain it is not very common, having been recorded from only nine English counties, viz. Northumberland, Cumberland, Lincs, Norfolk, Cambs, Essex, Surrey, Hants, and Devon ; there are no records from Wales, but it is found in both Scotland and Ireland.

460. **Corixa coleoptrata** Fabr. (Cymatia id. Osh. Cat.).

Fieb., E.S. 60, 3 (1794) ; D. & S., B.H. 614 (1865) ; Saund., H.H.B.I. 342 (1892).

Ova. The egg is quite different from the rest of the *Corixidae.* It is an elliptical body, not acuminate distally nor with an adhesive disc proximally, but attached to its support by a thread a little longer than the body of the egg ; it is opaque, pale ochreous, and the thread is clear, shining, and colourless ; the chorion is smooth and slightly shining. By the attaching thread one is reminded of the eggs of *Chrysopa* amongst the Neuroptera.

Larvae. An intermediate instar, 1¾ mm. Shape of body as in other species, but with head much broader than thorax, and projecting considerably beyond it ; colour brownish-yellow, with thorax much infuscated, and abdomen with a central longitudinal fascia, another on each side of it, the two meeting behind, and the connexivum fuscous, the central fascia carrying three or four pale spots in longitudinal row ; eyes very large ; pronotum invisible, mesonotum very transverse, and with the usual hairs, metanotum very short and transverse ; legs concolorous with body, but lighter at base, anterior pair with tibia and tarsus united and terminating in a long claw, that part which is equivalent to the tarsus much the longer, and carrying on both inner and outer margins a few tubercles, from which spring long, pale hairs ; intermediate tarsi one-jointed, longer than tibiae, claws short ; posterior tibia-tarsus one-jointed, long, and with long swimming hairs ; body generally closely pubescent, margins of abdomen with a few long hairs.

Next instar, 2½ mm. Very similar to the former, but with central abdominal fascia divided into two by a longitudinal pale line ; mesonotum much longer, carrying short wing-pads.

Life-cycle. The imago is to be found all the year round, and I have records for every month. The above larvae were taken in September. Thus, if there is but one brood per annum, the insect would mature before the end of October ; but this is very late for the insects of the year, and it seems probable that there must be an earlier brood also.

Habitat, etc. It occurs in ponds, and delights to frequent weeds such as *Myriophyllum.* Though so small, it is subject to the attacks of Hydrachnid parasites, only the very earliest stages of which, however, I have found upon them. There does not appear to be any strigil.

The pala of the ♂ has not any of the rows of pegs which are such an important feature in most of the species, but retains the form it has in the larva, with the few marginal tubercles carrying long hairs. The facial depression of the ♂ is very large and ends above in a curved ridge between the eyes at about $\frac{2}{5}$ of their length from the base. It is covered with a long white pubescence. The ♀ also has a flattened face, though not so much so as the ♂, and there is very little difference between the palae of the two sexes.

One specimen which I took in December I kept in a small aquarium till the end of April, when it died. During that time it must have fed either upon the weeds that were present, or upon very minute Entomostraca and Infusoria, for there was nothing else it could eat, and one cannot imagine that it spent an active life of over four months and fasted all the time.

It is usually brachypterous, with the pronotum very small and the membrane not distinct. Puton describes a macropterous ♀ thus : " Il est long de 4½ ; les ailes sont aussi longues que les élytres ; la membrane est bien formée, d'un brun enfumé uniforme, sans taches, séparée de la corie par une ligne vague à peine plus foncée ; le pronotum est sensiblement plus long que dans la forme brachyptère ; le dessous du corps, même les valves génitales, est entièrement flave, comme si l'exemplaire était récemment transformé." This is the *C. fasciolata* M. & R.

Mr. G. E. Hutchinson has observed this insect stridulating ; the method was quite different from that described under *C. panzeri*, for the pala seemed to be drawn across the opposite femur, making a short, sharp scrape, quite different from the sound produced by *C. panzeri*. It will be rmembered that the inner surface of the femur has a stridulating area, carrying a number of minute erect points.

Distribution. This little insect occurs throughout Europe, and in Algeria and Siberia. In Britain it has been found in sixteen English counties, viz. the coast counties from Lincs to Glo'ster, except Dorset, and in Staffs, Derby, Notts, Cambs, and Surrey. There are no records from either Wales, Scotland, or Ireland, consequently its northernmost limit is Lincolnshire.

461. **Micronecta minutissima** Lin.

Linn., F.S. 905 (1761) ; D. & S., B.H. 616 (1865) ; Saund., H.H.B.I. 342 (1892).

Ova. Undescribed.

Larvae. A late—probably the latest –instar, 1¼ mm. Shape broad oval, almost oblong, of an ochreous colour very much variegated with fuscous ; the chief fuscous markings are, a central and two side fasciae on the head, the same on the mesonotum, and a discal and apical patch on the wing-pads, and an interrupted fascia on the abdomen, broad at the base and much narrowed towards apex ; there are also two or three reddish spots on each side of the abdominal segments, which are also posteriorly margined with reddish ; legs yellowish, slightly infuscated ; intermediate claws rather short ; wing-pads large ; pronotum invisible ; tarsi one-jointed.

A much smaller larva is similar, but without wing-pads, and represents an instar which is probably the second earlier than the above.

Life-cycle. The imago has been found from May to August, and in October. The above larvae were taken in the New Forest in May, at the side of a small stream, where they were extremely abundant. They would probably have matured early in June. Buchanan White (4) states that it hibernates in the nymphal instars, which implies at least two generations in the year.

Habitat, etc. The insect is found on the borders of streams, especially such as are weedy. Wilkinson records it as "plentiful amongst confervae at Sculley Beck, Yorks, in June and July, 1868." I have found a small and dark form of the insect on the borders of Lake Padarn, at the foot of Snowdon; here it was disporting itself in the interspaces between the large blocks of stone with which the borders of the lake are encumbered. The var. *poweri*, on the other hand, is larger than the type form, dull ochreous with well defined black-brown markings. It was taken by Dr. Power in the New Forest. It is able to produce a chirping stridulation, and is provided with a strigil.

Distribution. There are a large number of Palaearctic species belonging to this genus, but as only our two species are of general European distribution, there does not seem to be much probability of the occurrence of others with us. The present species is distributed all over the Continent and in Morocco and Transcaspia. In Britain it has been recorded from eighteen English counties, viz. the coast counties from Yorks to Cornwall, except Suffolk and Kent, and also from Cumberland, Salop, Staffs, Cambs, Warwick, Worcester, Oxon, Middlesex and Surrey; the only Welsh record is from Carnarvonshire, but it is found in both Scotland and Ireland.

462. **Micronecta meridionalis** Costa. (M. scholtzi Osh. Cat.).

Costa, A. Add. Con. Cim. Neap. (1860); Saund., H.H.B.I. 343 (1892).

Ova and **Larvae.** Undescribed.

Life-cycle. The imago has been found in June, and from August to October.

Habitat, etc. This species is found in ponds and not in streams like *M. minutissima.* I have taken it in great numbers round the roots of clumps of rushes growing at the margin of a pond. Like the preceding, it is evidently a gregarious insect. It has not been heard to chirp like *M. minutissima*, though provided with a strigil.

Distribution. It is distributed over Central and Southern Europe and in Northern Africa. In Britain it is not so common as *M. minutissima.* It has been found in only seven English counties, viz. Lincs, Norfolk Essex, Surrey, Sussex, Hants, and Somerset, and not elsewhere.

BIBLIOGRAPHY

Amyot, C. J. B. Entomologie Française—Rhynchota, 1848.
Amyot and Serville. Histoire Naturelle des Insectes—Hémiptères, 1843.

Bacot, A. Bionomics of Cimex hirundinis, Proc. Ent. Soc. Lond., 1921, ii.
Ball, R. Sounds produced by Corixa, Ann. Mag. Nat. Hist., 1846, 135.
Beare, T. Hudson. Lygaeus equestris at St. Margaret's Bay, E.M.M., xliii, 237.
Beaumont, A. Rare Hemiptera at Gosfield, Essex, E.M.M., xxxix, 300.
Bedwell, E. C.—
(1) Odontoscelis dorsalis, Fabricius, a British Insect, E.M.M., xlv, 253.
(2) Capture of Xanthochilus quadratus, Fab., E.M.M., lvi, 280.
Bergroth, E.—
(1) Note on the genus Aëpophilus, Sign., E.M.M., xxxv, 282.
(2) The British species of Aneurus, Curt., E.M.M., li, 16.
(3) Note on Aphelochirus aestivalis, Fabr., E.M.M., liii, 252.
(4) Neue Myrmecophile Hemipteren, Wien. Ent. Zeit., xxii, 253–6.
Bignell, G. C.—
(1) Lopus sulcatus at Torcross, E.M.M., xxv, 326.
(2) Pyrrhocoris apterus on the Oreston Rock, E.M.M., xxxiv, 112.
Billups, T. R.—
(1) Lasiosomus enervis, H.S. near Weybridge, E.M.M., xviii, 161.
(2) Ceraleptus lividus Stein, etc., at Chobham, E.M.M., xxi, 277.
(3) Exhibits, Proc. Ent. Soc. Lond., 1884, xi.
Blatch, W.—
(1) Capture of Ceratocombus and Cryptostemma, E.M.M., xviii, 113.
(2) Recent captures of Coleoptera and Hemiptera in the Birmingham District, E.M.M., xx, 19.
(3) Aradus corticalis in the New Forest, E.M.M., xx, 86.
Blathwayt, P. List of terrestrial Hemiptera-Heteroptera taken in the neighbourhood of Bath, Proc. Bath Club, vi, 432.
Bloomfield, Rev. E. N.—
(1) Bothynotus pilosus, Boh., near Hastings, E.M.M., xvii, 165.
(2) Note on the food of Bothynotus pilosus, E.M.M., xvii, 176.
(3) Coleoptera, etc., near Hastings, E.M.M., xviii, 40.
(4) The Natural History of Hastings and St. Leonards and the vicinity (with suppts.), 1878, etc.
Boitard, P. Curiosités d' Histoire Naturelle, 1828.
Bold, T. J.—
(1) Catalogue of Insects of Northumberland and Durham, Hemiptera-Heteroptera, Nat. Hist. Tr. N. & D.
(2) Note on monstrosity in the antennae of a bug, E.M.M., ii, 207.
(3) Recapture of Heterocordylus unicolor, E.M.M., iv, 348–69.
(4) Corixa wollastoni flying at night, E.M.M., vi, 138.
Bordas, L. Salivary glands, Ac. Sc. C.R., 1905, 595–7.

Breddin, E.—
(1) Nachahmungverscheinungen bei Rhynchoten, Zeit. für Naturwiss., lxix, 1896.
(2) Le mimétisme chez les Hémiptères, Bull. Soc. Lin. Nord. Fr., xv, 1900.
Brischke. Die Raupen der Dasychira selenitica, Ent. Nachr., 1881, iii, 52.
Britten, H.—
(1) Cimex pipistrelli, Jenyns, in Oxfordshire, E.M.M., lii, 142.
(2) Gastrodes abietis, L. in Oxfordshire, E.M.M., lii, 261.
(3) Hemiptera in Cumberland, E.M.M., lii, 278.
(4) Psallus vitellinus, Scholtz, in Oxfordshire, E.M.M., lii, 279.
(5) Metatropis rufescens in Berkshire and Oxfordshire, E.M.M., liii, 182.
(6) Ploiariola baerensprungi, Dohrn., in Oxfordshire, E.M.M., liii, 182.
(7) Berytus clavipes, F., in Oxfordshire, E.M.M., liii, 183.
Brown, J. L.—
(1) Capture of Aphelocheirus aestivalis in Norfolk, E.M.M., xi, 92.
(2) A further note about Aphelocheirus aestivalis, E.M.M., xi, 117.
Brown, R. Sur les antennes anormales des Hémiptères, Bull. Soc. Ent. Fr., 1900.
Brullé, A. Histoire Naturelle des Insectes, ix, 1835.
Bueno, D. T.
(1) Stridulation of Ranatra fusca, Canad. Ent., 1900, 235.
(2) Notes on the Collection, preservation, and rearing of Aquatic Hemiptera, Canad. Ent., 1905, 137–42.
(3) Life-Histories of American water-bugs, (iii) Microvelia americana, Canad. Ent., 1910.
(4) Algunos Hemipteros de Cataluña, Bol. Soc. Arag. Cien. Nat., 1912.
(5) Phototropism in Heteroptera, Bull. Brooklyn Ent. Soc., 1914.
(6) Brief notes towards the Life History of Pelocoris femorata, Pal. B., with a few remarks on habits, Journ. N. York Ent. Soc., xi, 166–73.
Burmeister, H. Manual of Entomology, 1836.
Butler, E. A.—
(1) Captures near Hastings, E.M.M., xvii, 67.
(2) Captures of Hemiptera in 1880, E.M.M., xvii, 234.
(3) Notes on Hemiptera at Battle, etc., E.M.M., xviii, 113.
(4) Hemiptera at Hurst Green, E.M.M., xix, 115.
(5) Hemiptera and Coleoptera at Chobham, E.M.M., xix, 140.
(6) A hunting-ground on the south-east coast, E.M.M., xxi, 20.
(7) Additions to the Hemiptera of the Hastings District, E.M.M., xxi, 113.
(8) Habitat of Miridius quadrivirgatus, Costa, E.M.M., xxiii, 107.
(9) Hemiptera at Ewhurst, E.M.M., xxv, 401.
(10) Capture of Nabis (Stålia) boops, Schiödte, E.M.M., xxvi, 296.
(11) Note on the habits of Verlusia rhombea, Lin., E.M.M., xxvi, 296.
(12) Hemiptera-Heteroptera near Lowestoft, E.M.M., xxvii, 277.
(13) Lebia crux-minor at Gomshall, E.M.M., xxviii, 267.
(14) Reduvius personatus in a wasp's nest, E.M.M., xxviii, 289.
(15) On the habits of Mesovelia furcata, Muls. and Rey., E.M.M., xxix, 232.
(16) An aberrant (?) form of Stenocephalus agilis, Scop., E.M.M., xxxi, 76.
(17) Bothynotus pilosus and other Hemiptera in North Kent, E.M.M., xxxiii, 236.
(18) Peribalus vernalis in Suffolk, E.M.M., xxxvii, 302.
(19) Two additional species of British Hemiptera, E.M.M., xl, 275.
(20) Hemiptera, etc., at Deal, E.M.M., xlii, 162.
(21) Piezostethus flavipes, Reut., at Carmarthen, E.M.M., xliii, 14.

Butler, E. A.—(*continued*)—

(22) Peritrechus gracilicornis, Put., and other Hemiptera in the Isle of Wight, E.M.M., xliii, 253.
(23) Cymus obliquus, Horv., an addition to the list of British Hemiptera, E.M.M., xlv, 59.
(24) Cymus obliquus, Horv., a correction, E.M.M., xlv, 85.
(25) Cyrtorrhinus geminus, Flor, an addition to the list of British Hemiptera, E.M.M., xlvi, 29.
(26) Poeciloscytus palustris, Reut., an addition to the list of British Hemiptera, E.M.M., xlvi, 141.
(27) A contribution towards the Life History of Miris laevigatus, L., E.M.M., xlvii, 36.
(28) Stenocephalus medius, M. & R., an addition to the list of British Hemiptera, E.M.M., xlvii, 134.
(29) On the eggs of two British species of Coreidae, E.M.M., xlviii, 36.
(30) Psallus vitellinus, Scholtz, an addition to the list of British Hemiptera, E.M.M., xlviii, 60.
(31) Stridulation in British Reduviidae, E.M.M., xlviii, 65.
(32) Hemiptera in Carmarthenshire, E.M.M., xlviii, 108, 187.
(33) Pentatoma (Tropicoris) rufipes and caterpillars, E.M.M, xlviii, 239.
(34) An additional locality for Psallus vitellinus, Scholtz, E.M.M., xlviii, 240.
(35) A contribution to the Life History of Berytus clavipes, F., E.M.M., xlix, 28.
(36) Pygolampis bidentata, Goeze, in the New Forest, E.M.M., l, 176.
(37) On the ova and young larvae of Berytus signoreti, Fieb., E.M.M., l, 220.
(38) Lygus rubicundus, Fall., an addition to the list of British Hemiptera, E.M.M., l, 283.
(39) Aepophilus bonnairei, Sign., at Sennen Cove, E.M.M., li, 194.
(40) Brachyarthrum limitatum, Fieb., a Capsid new to the British list, E.M.M., li, 290.
(41) On the distribution of Miris holsatus, F., in Britain, E.M.M., lii, 65.
(42) Notes on the genus Teratocoris, Fieb. (Capsidae), E.M.M., lii, 255.
(43) A contribution to the Life History of Piezodorus lituratus, L., E.M.M., liii, 34.
(44) The British species of Aphelochirus (Hemiptera), E.M.M., liii, 180.
(45) Two additions to the list of British Hemiptera-Heteroptera, E.M.M., liii, 251.
(46) A further note on Aphelochirus, E.M.M., liii, 278.
(47) Note on Coranus subapterus, De G., E.M.M., liv, 16.
(48) On the association between the Hemiptera-Heteroptera and Vegetation, E.M.M., liv, 132.
(49) The association between the Hemiptera-Heteroptera and Vegetation, an addendum, E.M.M., liv, 184.
(50) The European species of Microvelia, E.M.M., liv, 212.
(51) New localities for some interesting Hemiptera, E.M.M., lv, 17.
(52) Hemiptera in Jersey, E.M.M., lv, 137.
(53) Lasiacantha capucina, Germ., a Tingid bug new to the British List, E.M.M., lv, 203.
(54) Pond Life—Insects.
(55) Our Household Insects, 1893.
(56) Halticus saltator, an addition to the List of British Hemiptera, Ent. Rec., xxiii, 234.

Butler, E. A—(*continued*)—
(57) A new British Capsid (Hemiptera), Ent. Rec., xxxi, 9.
(58) The Hemiptera of the Hastings District, Hastings and East Sussex Naturalist, 1906.
(59) Plagiognathus (Neocoris) nigritulus, Zett., and bohemani, Fall., E.M.M., lvi, 92.
(60) A Capsid new to Britain, E.M.M., lvii, 30.
(61) On Nabis lativentris, Boh. (Hemiptera-Heteroptera), E.M.M., lvii, 57.
(62) A contribution to the Life History of Pentatoma rufipes, L., E.M.M., lviii, 152.
(63) A contribution towards the Life History of Dictyonota strichnocera, Fieb., E.M.M., lviii, 179.
(64) A contribution to the Life History of Deraeocoris ruber, L., E.M.M., lviii, 200.

Campion, F. W. and H. A raid by Nabis limbatus, Ent., xxxviii, 281.

Carpenter, G. H. Aëpophilus bonnairei, Sign., on the Irish coast, E.M.M., xxxiii, 62.

Carr, Prof. J. W. Nottinghamshire Hemiptera.

Chabanaud, P. and Roger M. Sur une phénomène tératologique observé chez Enoplops scapha, F., Bull. Soc. Ent. Fr., 1900.

Champion, G. C.—
(1) Drymus pilicornis and other Hemiptera in the Isle of Sheppey, E.M.M., xxiii, 139.
(2) Aëpophilus bonnairei, Sign., in the Isle of Wight, E.M.M., xxx, 258.
(3) Tachys parvulus Dej., etc., in Cornwall, E.M.M., xxxiii, 214.
(3a) A preliminary list of Coleoptera and Hemiptera of the Scilly Islands, E.M.M., xxxiii, 217.
(4) Metatropis rufescens, H.S., etc., at Woking, E.M.M., xxxiv, 209.
(5) Ploiaria baerensprungi, Dohrn, an addition to the list of British Reduviidae, E.M.M., xxxiv, 217.
(6) Coleoptera, etc., in the Isle of Wight, E.M.M., xxxiv, 219.
(7) Captures of Hemiptera at Woking, etc., E.M.M., xxxv, 270.
(8) Pachycoleus rufescens, Sahlb. (fam. Ceratocombidae), in Devonshire, E.M.M., xliv, 8.
(9) Coleoptera and Hemiptera-Heteroptera in Devonshire, E.M.M., xliv, 32.
(10) Pachycoleus rufescens, Sablb., in the New Forest, E.M.M., xlix, 187.
(11) Aradus lawsoni, Saunders—a synonymical note, E.M.M., l, 92.
(12) Hemiptera-Heteroptera, etc., in S. Devon, E.M.M., li, 312.
(13) Coleoptera, Hemiptera, etc., in Devonshire, E.M.M., liii, 14.
(14) Further note on the habits, etc., of the Rhododendron Tingid, Leptobyrsa rhododendri, Horv., E.M.M., liii, 236.
(15) Notes on Devonshire Insects, E.M.M., liii, 277.
(16) Hemiptera, etc., in the New Forest, E.M.M., lv, 209.
(17) The tibial comb of Deraeocoris, Kirschb., E.M.M., lvii, 210.
(18) Aradus betulae L., E.M.M., lvii, 228.
(19) Miridae (Capsidae) common to Britain and N. America, E.M.M., lviii, 109.

Champion and Lloyd. Some interesting British Insects, E.M.M., xlv, 196.

Charbonnier, H. J. On the habits of Ploiaria culiciformis, De G., E.M.M., xxxix, 123.

Chitty, A. J.—
(1) Strachia festiva, Lin., E.M.M. xxxii, 141.
(2) Lasiosomus enervis, H.S., near Doddington, Kent, E.M.M., xxxviii, 66.

Chitty, A. J.—(*continued*)—
    (3) Strachia oleracea, Lin., in East Kent, E.M.M., xxxviii, 182.
    (4) Collecting in old hedges near Faversham, Kent, E.M.M., xl, 103.
    (5) Capture of Peribalus vernalis, Wolff., at Huntingfield, E.M.M., xl, 111.
Collett, E. P.—
    (1) Sehirus biguttatus and other Hemiptera near Hastings, E.M.M., xvii, 259.
    (2) Rare Hemiptera near Hastings, E.M.M., xvii, 278.
    (3) Hemiptera at Hastings, E.M.M., xviii, 140.
    (4) Calyptonotus lynceus at the Camber sandhills, E.M.M., xix, 117.
    (5) Ceraleptus lividus, Stein, etc., at the Camber sandhills, E.M.M., xix, 139.
    (6) Captures of Coleoptera, etc., in the Hastings District in 1883, E.M.M., xx, 189.
Collins, J. Notes on Oxford Hemiptera, E.M.M., xlvii, 278.
Comstock, J. H. and A. B. A Manual of the Study of Insects, 1917.
Conradi. Variations in protective value of stink of Hemiptera, Science, xix, 393, 394.
Cooke, B. Contribution to a list of the Hemiptera of Lancashire and Cheshire, The Naturalist, vii, 144; viii, 337.
Corbett, H. V. Aphelochirus aestivalis, Fabr., in Nottinghamshire, E.M.M., li, 330.
Costa, A.—
    (1) Cimicum Regni Neapolitani Centuriae, 1838–52.
    (2) Additamenta ad Centuria Cimicum Regni Neapolitani, 1860.
Curtis, J. British Entomology, Hemiptera.
Curzon, E. R. Stenocephalus agilis in South Wales, E.M.M., vii, 157.

Dale, C. W.—
    (1) Capture of Metatropis rufescens, H.S., E.M.M., xxvi, 244.
    (2) The History of Glanvilles Wootton, 1878.
Dallas, W. S. Note on the British species belonging to the genus Acanthosoma, 1851.
Dalla Torre, K. W. Beiträge zur Phyto- und Zoostatik des Egerlandes.
Day, F. H.—
    (1) Cumberland Hemiptera-Heteroptera, The Naturalist, 1916, 252.
    (2) The food-plant of Calocoris alpestris, Mey., E.M.M., liii, 183.
    (3) Orthotylus virens, Fall., E.M.M., liv, 227.
    (4) Cumberland Hemiptera-Heteroptera, The Naturalist, 1920, 16.
De Geer, Carl. Mémoires pour servir à l'Histoire des Insectes, III.
Donisthorpe, H. St. J.—
    (1) Myrmecophilous notes, Ent. Rec., xviii, xix, xxi, xxii, xxiii.
    (2) British Ants, 1915.
    (3) Nabis lativentris, Boh., a Myrmecophilous Insect, E.M.M., lvii, 136.
Douglas, J. W.—
    (1) On the occurrence of Systellonotus triguttatus in company with Formica fusca., E.M.M., ii, 30.
    (2) On the occurrence of Gonocerus venator, a rare British Hemipteron, E.M.M., ii, 46.
    (3) On some peculiarities in the development of Hemiptera-Heteroptera, E.M.M., ii, 270; iii, 200; iv, 30.
    (4) About aquatic Hemiptera, including notices of new British species, E.M.M., iii, 25.

Douglas, J. W.—(*continued*)—
- (5) Abundance of winged Velia, 1868, E.M.M., vi, 10.
- (6) Henestaris laticeps, Curt., E.M.M., vi, 89.
- (7) Captures at Deal from 22nd to 30th September, E.M.M., vii, 137.
- (8) Captures of Hemiptera and Coleoptera at Deal, E.M.M., ix, 192.
- (9) Captures of Hemiptera on the west coast of Scotland, with description of a new species, E.M.M., xi, 118.
- (10) On the mode of stridulation of Coranus subapterus, De Geer, E.M.M., xi, 137.
- (11) On the resemblance to ants among the Hemiptera, E.M.M., xi, 138.
- (12) Abnormal structure of antennae of Hemiptera, E.M.M., xiii, 188.
- (13) Note on Gerris thoracica, E.M.M., xvi, 42.
- (14) Aëpophilus bonnairei, a remarkable new Hemipterous insect, E.M.M., xvi, 68.
- (15) What is meant by the term species? E.M.M., xvi, 217.
- (16) Charagochilus gyllenhali macropterous, E.M.M., xvii, 164.
- (17) Macropterous forms in the genera Blissus and Plinthisus, E.M.M., xvii, 164.
- (18) Gerris lacustris in hibernation far from water, E.M.M., xix, 20.
- (19) Garden insects in 1882, E.M.M., xix, 119.
- (20) On the British species of Eremocoris, E.M.M., xix, 266.
- (21) Hemiptera at Lewisham, E.M.M., xxii, 115.
- (22) Two new species of Hemiptera on mistletoe, E.M.M., xxv, 256.
- (23) Lygus viscicola, Puton, in England, E.M.M., xxv, 396.
- (24) A new species of Anthocoris, E.M.M., xxv, 427.
- (25) Lygus viscicola, Puton, E.M.M., xxv, 457.
- (26) Psallus ambiguus, Fall., flying at night, E.M.M., xxvi, 297.
- (27) On the occasional development of wings in species of Hemiptera usually micropterous or apterous, E.M.M., xxvii, 109.
- (28) Aëpophilus bonnairei with an abnormal antenna, E.M.M., xxxi, 144.
- (29) Capsus laniarius feeding, E.M.M., xxxi, 238.
- (30) The Cimex in the nests of domestic fowls, E.M.M., xxxiii, 159.
- (31) Acanthiae on tame rabbits, E.M.M., xxxiv, 138.

Douglas, J. W., and Scott, J.—
- (1) The British Hemiptera-Heteroptera, Ray Society, 1865.
- (2) Additions to the British Fauna (Hemiptera), E.M.M., ii, 217, 246, 272; iii, 13.
- (3) British Hemiptera, additions and corrections, E.M.M., iv, 1, 45, 95, 238, 265; v, 259, 293; vi, 241.

Dufour, Léon—
- (1) Recherches anatomiques et physiologiques sur les Hémiptères, Mém. sav. étrang. Ac. Sci. France, iv, 1833.
- (2) Habitat du Serenthia laeta, Ann. Soc. Ent. Fr., 1851, 56.

Edmonds, T. Hemiptera-Heteroptera in South Devon and in the neighbourhood of Bath, E.M.M., li, 220.

Edwards, J.—
- (1) Fauna and Flora of Norfolk, Hemiptera, Trs. Norf. and Norw. Nat. Sc. III.
- (2) Vacat.
- (3) An additional species of British Hemiptera, E.M.M., xvii, 150.

EDWARDS, J.—(*continued*)—
(4) Gerris rufoscutellata, Latr., near Norwich, E.M.M., xxi, 21.
(5) British Hemiptera, additional species, E.M.M., xxiv, 196.
(6) The British species of Scolopostethus, E.M.M., xxv, 278.
(7) On Scolopostethus adjunctus, etc., E.M.M., xxv, 380.
(8) Table of the British species of Anthocoris, with a notice of an additional species, E.M.M., xxvi, 236.
(9) British Hemiptera, additions and corrections, E.M.M., xxx, 101.
(10) On the British species of Notonecta, E.M.M., liv, 56.
ENOCK, F.—
(1) On the oviposition of Ranatra linearis, E.M.M., xxxvi, 161.
(2) Proceedings of South London Entomological Society, 1900, 77.
(3) Proceedings of Ent. Soc. Lond., 1900, xii.
EVANS, W.—
(1) Nepa cinerea, L., in Scotland, E.M.M., xxxvi, 188.
(2) Some records of Scottish Coleoptera and Hemiptera, Ann. Scot. Nat. Hist., 1900, 101, 252; 1901, 194.

FABRE, J. H. Souvenirs entomologiques, viii.
FALLÉN, C. F. Monographia Cimicum Sueciae, 1807.
FIEBER, F. X.—
(1) Entomologische Monographien, 1844.
(2) Die Europäischen Hemiptera, 1860, 61.
FLETCHER, J. E. Gastrodes abietis in Worcestershire, E.M.M., xvi, 278.
FLOERSHEIM, C. Heterotoma merioptera destroying eggs of Papilio. Proc. Ent. Soc. Lond., 1906, xc.
FLOR, G. Die Rhynchoten Livlands, 1860–1.
FORDHAM, W. J. Preliminary List of Yorkshire Hemiptera-Heteroptera, The Naturalist, 1921.
FOWLER, Rev. W. W.—
(1) Trechus lapidosus, Daws., and other Coleoptera, etc., at Charmouth, Dorset, E.M.M., xxvii, 305.
(2) Colias edusa (Helice) at Charmouth, E.M.M., xxviii, 286.
(3) Coreus denticulatus, Scop., at Lincoln, E.M.M., xxxvi, 262.
(4) Hemiptera, etc., at Rotherfield Peppard, Henley-on-Thames, E.M.M., xxxix, 17.
FRANCIS, HORACE. Captures of local Hemiptera, E.M.M., xxiii, 213.
FREY-GESSNER, E. Beitrag zur Hemipteren fauna Graubündens, 1874.
FRYER, J. C. F. Capsid Bugs, Journal of Agriculture, Jan., 1916.

GADEAU DE KERVILLE, H.—
(1) Bull. Soc. Ent. Fr., 1884.
(2) Le Naturaliste, 1887.
(3) Bull. Soc. Ent. Fr., 1888.
GIARD, A. Atractotomus mali, Mey., parasite des chenilles d'Hyponomeuta malinellus, Zett., and padellus, L., Bull. Soc. Ent. Fr., 1900.
GIRAULT, A. A.—
(1) The Bed Bug, Psyche, 1905, 61.
(2) The present status of the Bed Bug in the transmission of human diseases.
GIRAULT, A. A. and STRAUSS. The Bed Bug and the Fowl Bug.
GREDLER, P. V. M. Rhynchota Tirolensia, 1870.
GUÉRIN, J., and PÉNEAU, J. Faune Armoricaine, Hemiptères.

Guermonprez, H. L. F. Nabis boops, Schiödte, in Sussex, E.M.M., xliii, 110.
Gulde, J. Die Dorsaldrüsen der larven der Hemiptera-Heteroptera, Ber. Sen. Nat. Ges. Frankf., 1902, 85–136.

Halbert, J. N.—
(1) Lygus atomarius, Mey., and other Hemiptera in Ireland, E.M.M., xxx, 64.
(2) Hemiptera of Clonbrook, Irish Nat., v, 1896, 229.
(3) Hemiptera of Kenmare, Irish Nat., vii, 1898, 216.
(4) Irish Hemiptera, Irish Nat., 1909, 252.
(5) Clare Island Survey, Hemiptera, Proc. Roy. Irish Ac., xxxi, 1912.
Hall, C. G.—
(1) Note on Miridius quadrivirgatus Costa, E.M.M., xxiii, 90.
(2) Lygaeus equestris, L., at Dover, E.M.M., xxiii, 106.
(3) Hemiptera-Heteroptera at Dover and its vicinity, E.M.M., xxvi, 81.
Hallett, H. M. The Hemiptera of Glamorgan.
Hamm, A. H. Gastrodes abietis, L., in the New Forest, E.M.M., xlvii, 161.
Handlirsch, A. Zur Kenntnis der Stridulationsorgane bei den Rhynchoten, Ann. Nat. Hofm. Wien, 1900.
Harwood, B. S.—
(1) Pentatoma fuscispina on the North Essex Coast, E.M.M., xxxviii, 66.
(2) Macropterous Nabis, etc., at Colchester, E.M.M., xli, 262.
Harwood, P. Aradus betulae, L., an addition to the British Hemiptera-Heteroptera, E.M.M., lvii, 227.
Hausmann, S. F. L. Magazin für Insektenkunde, 1802.
Hellins, Rev. J.—
(1) A fragment of a Life History of Acanthosoma grisea, E.M.M., vii, 53.
(2) Note on the habit of Acanthosoma griseum, E.M.M., ix, 13.
(3) Additional notes on the egg-laying of Acanthosoma griseum, E.M.M., xi, 42.
Hewitt, C. G. Some observations on the reproduction of the Hemiptera-Cryptocerata, Trs. Ent. Soc. Lond., 1906.
Hickman, D. Illustrations of the Male Hooks in Nabis, Bull. Brookl. Ent. Soc., xvi, 58.
Holmes, S. J. Phototaxis in Ranatra, Science, xix, 212.
Horváth, G.—
(1) Synopsis of the genus Scolopostethus, E.M.M., xxvii, 116.
(2) Synopsis Tingitidarum Regionis Palaearcticae, Ann. Mus. Nat. Hung., iv, 1906.
(3) Les Relations entre les Faunes Hémiptérologiques d'Europe et de l'Amérique du Nord, Ann. Mus. Nat. Hung., vi, 1908.
(4) Remarques sur quelques Hémiptères de l'Amérique du Nord, Ann. Mus. Nat. Hung., vi, 1908.
(5) Revision of the American Cimicidae, Ann. Mus. Nat. Hung., 1912 (x).
(6) Notes sur le genre Nysius, Ann. Mus. Nat. Hung., 1910.
(7) Synopsis of the genus Aphelochirus, Term. Füz., 1899.
(8) Die Entdeckung der Wanze Cimex dissimilis, Horv., in Böhmen., Ac. Soc. Ent. Boh., 1913.
(9) La Distribution géographique des Cimicides et l'Origine des Punaises des lits, Cong. Int. Zoo., 1913.
(10) Monographie des Mesovéliides, Ann. Mus. Nat. Hung., 1915, xiii.
(11) Note sur les deux Microvelia d'Europe, Ann. Mus. Nat. Hung., 1916, xiv.

HUNGERFORD, H. B. Biology and Ecology of Aquatic and Semiaquatic Hemiptera, Kansas Univ., 1919.
HUTCHINSON, G. E.—
(1) Gerris asper, Fab., in Norfolk, E.M.M., lv, 33.
(2) Notonecta halophila, Edw., in Cornwall, E.M.M., lv, 261.
(3) Nabis boops, Schiödte, in Wiltshire, etc., E.M.M., lvii, 18.
(4) Two records of Hemiptera, E.M.M., lvii, 39.

JEFFERY, W. R. A note on the Life History of Reduvius personatus, L., E.M.M., xlv, 280.
JENNINGS, F. B.—
(1) Notes on some interesting Hemiptera met with in 1897, E.M.M., xxxiv, 13.
(2) Acanthosoma tristriatum, etc., at Tring., E.M.M., xxxv, 270.
(3) Podops inunctus, Fab., in the Lea Valley, E.M.M., xxxv, 270.
(4) Reoccurrence of Sciocoris cursitans, F., at Box Hill, E.M.M., xxxviii, 39.
(5) A melanic aberration of Miris laevigatus, L., E.M.M., xxxviii, 224.
(6) A melanic form of Miris virens, Linn., E.M.M., xxxix, 18.
(7) Miscellaneous notes on British Heteroptera, E.M.M., xxxix, 69.
(8) Coleoptera and Hemiptera in various localities in 1907, E.M.M., xliv, 63.
JENYNS, Rev. L. Three species of Cimex, An. Nat. Hist., iii, 242–4 (1839).
JOHNSON, Rev. W. F.—
(1) Hemiptera in the North of Ireland, E.M.M., xxix, 35.
(2) Note on Piezodorus lituratus, Fab., E.M.M., xxxvii, 73.

KALTENBACH, J. H. Die Pflanzenfeinde aus der Klasse der Insekten, 1874.
KARSCH, F.—
(1) Lygus pratensis als Schädiger der Fuchsien, Ent. Nachr., 1889, 57.
(2) Eurydema oleraceum, Ent. Nachr., 1889, 383.
KAWALL, H. Coreus marginatus, L., Stett. Ent. Zeit., 1861, 127.
KERSHAW, J. C. How a froghopper feeds, Sugar, 1913.
KEYS, J. H.—
(1) Aëpophilus bonnairei, Signoret., E.M.M., xxiv, 174.
(2) Aëpophilus bonnairei, E.M.M., xxvi, 247.
(3) Some remarks on the habits of Aëpophilus bonnairei, Sign., E.M.M., xxxi, 135.
(4) Coleoptera, etc., at Mary Tavy, South Devon, E.M.M., xxxv, 291.
(5) Pachycoleus rufescens, Sahlb., at Loddiswell, South Devon, E.M.M. xliv, 42.
(6) Some further remarks on Aëpophilus bonnairei, Sign., E.M.M., l, 284.
KILBURNE, W. R. Aëpophilus bonnairei, E.M.M., xxvi, 273.
KIRKALDY, G. W.—
(1) Revision of the Notonectidae, Trs. Ent. Soc. Lond., 1897.
(2) Notes on Aquatic Rhynchota, Ent., xxxi, 2, 101.
(3) A guide to the study of British water-bugs, Ent., xxxi, xxxiii, xxxviii, xxxix.
(4) On the specific distinctness of Corixa carinata and C. germari, and the restoration of the latter to the list of British Rhynchota, Ent., xxxi, 249.
(5) On the nomenclature of the European subgenera of Corixa, Geoffr. (Rhynchota), Ent., xxxi, 252.
(6) Gerris lacustris nymph in October (Deal), Ent., xxxiii, 355.

Kirkaldy, G. W.—(*continued*)—
(7) The stridulation of Corixa, Ent. xxxiv, 9.
(8) Gerris costae at Deal, Ent. xxxiv, 256.
(9) Corixa saundersi, a new species of aquatic Rhynchota from England, E.M.M., xxxv, 2.
(10) A fortnight in Scotland in search of aquatic Rhynchota, E.M.M., xxxv, 49.
(11) The stridulating organs of water-bugs, Journ. Quek. Micr. Cl., 1901.
(12) On the interesting nature of Hemipterous metamorphoses, Ent., xli, 58.
(13) Catalogue of Hemiptera-Heteroptera, Vol. I, 1909.
Kuhlgatz, Th. Beitrag zur Kenntnis der Metamorphose geflügelten Heteropteren.

Lange, D., Flight of Corixa at St. Paul, Minnesota, Can. Ent., 1905, 364.
Leake, R. M. Hemiptera at Purfleet, Essex, Ent., xxviii, 312.
Lefebvre, A. Poison glands in Nepa, Ann. Soc. Brux., xxvii, 194.
Leuckart, R. Ueber die Mikropyle und den feinern Bau der Schalenhaut bei den Insekteneiern.
Linnell, J. A list of Reigate Hemiptera, Proc. Holmesdale Nat. Hist. Cl., 1866–7, 373.
Luff, W. A.—
(1) A list of Hemiptera-Heteroptera collected in the Island of Guernsey, E.M.M., xxvi, 129.
(2) Additions to ditto, E.M.M., xxviii, 7.
(3) The Insects of Alderney, Tr. Guern. Soc. Nat. Sci., 1899.
(4) The Insects of Herm, Tr. Guern. Soc. Nat. Sci., 1904.
(5) The Insects of Jethou, Tr. Guern. Soc. Nat. Sci., 1904.
(6) The Insects of Sark, Tr. Guern. Soc. Nat. Sci., 1906.
(7) The Insects of Jersey, Tr. Guern. Soc. Nat. Sci., 1908.
Lugger, Otto. Bugs injurious to our cultivated plants, Univ. Minnesota, Agr. Exp. St. Bull., 69.

McGregor, T. M.—
(1) Hemiptera, Heteroptera and Homoptera, collected in Perth District in 1892, E.M.M., xxix, 92.
(2) List of Hemiptera, Heteroptera and Homoptera, in Perthshire, Ann. Scot. Nat. Hist., 1893, 213.
(3) Perth Hemiptera, Trs. Perth. Soc. Nat. Sc., 1895 and 1898.
Main, Jas. Habits of the boat fly, Mag. Nat. Hist., 1837.
Marchal, P. Sur les moeurs et le rôle utile de Nabis lativentris, Boh., Bull. Ent. Soc. Fr., 1900.
Marquand, E. D. Aëpophilus bonnairei, Signoret., E.M.M., xxiii, 169.
Marshall, Rev. T. A.—
(1) Hemiptera and Hymenoptera of Freshwater Bay, Pembrokeshire, E.M.M., iii, 92.
(2) Hemiptera at Loch Rannoch, E.M.M., iii, 118.
Martin, J. O. Study of Hydrometra lineata, Can. Ent., 1900, March.
Mason, J. E.—
(1) List of some Hemiptera-Heteroptera of Lincolnshire, with notes on collecting, The Naturalist, 1888, 287.
(1a) Additions to the List of some Hemiptera-Heteroptera of Lincolnshire, The Naturalist, 1889, 128.

Mason, J. E.—(*continued*)—

(2) Dicyphus constrictus, Boh., E.M.M., xxv, 36.
(3) Hemiptera-Heteroptera in West Cornwall, E.M.M., xxv, 237.
(4) Note on Nabis limbatus, E.M.M., xxv, 467.
(5) Further additions to the list of some Hemiptera-Heteroptera of Lincolnshire, The Naturalist, 1895, 213.
(6) Additions to the list of Hemiptera-Heteroptera of Lincolnshire, The Naturalist, 1898, 209.
(7) Some Hemiptera-Heteroptera of the Isle of Man, The Naturalist, 1898, 139.
(8) Hemiptera in the Channel Islands, E.M.M., xxxiv, 209.
(9) Gerris najas, De G., in the North, E.M.M., xxxiv, 210.
(10) Some Hemiptera from Kenmare, Irish Nat., xii, 101.

Mayet, V. Les insectes de la vigne, 1870.

Meyer Dur. Verzeichniss der in der Schweitz einheimischen Rhynchoten i. Die Familie der Capsini, 1843.

Miall, L. The Natural History of Aquatic Insects, 1903.

Moncreaff. On Metatropis rufescens, E.M.M., viii, 136.

Montrouzier, le P. Essai sur la Faune de l'île de Woodlark ou Moiou, An. Soc. Phys. et Nat. Agr. Lyon, viii (1851–2).

Morley, C.—

(1) The New Forest in May, E.M.M., xxxi, 194.
(2) A quarter of an hour on the Breck, E.M.M., xxxvi, 288.
(3) Psallus variabilis, Fall., parasitised, E.M.M., xl, 184.
(4) The Hemiptera of Suffolk, 1905.
(5) A second British specimen of Pseudophloeus waltli, H.S., E.M.M., lvi, 232.

Mouffet, T. Insectorum sive Minimorum Animalium Theatrum, 1634.

Mulsant and Rey. Histoire Naturelle des Punaises de France.

Murray, Jas.—

(1) Cumberland Hemiptera-Heteroptera, E.M.M., li, 145.
(2) Bothynotus pilosus, Boh., near Carlisle, E.M.M., li, 313.
(3) Cumberland Hemiptera-Heteroptera, E.M.M., lii, 66.
(4) Cumberland Hemiptera-Heteroptera, E.M.M., liii, 12.
(5) Hemiptera in Northumberland, E.M.M., liv, 252.

Myers, J. G. The Life History of some New Zealand Insects, No. 1, Trs. N.Z. Inst., liii, 235.

Newbery, E. A. Salda C-album, Fieb., and vestita, D. & S., E.M.M., xxxviii, 16.

Norman, G.—

(1) Captures of Hemiptera-Heteroptera in Morayshire, E.M.M., xiv, 165.
(2) Morayshire Hemiptera, E.M.M., xv, 255.
(3) List of Hemiptera-Heteroptera occurring at Pitlochry, Perthshire, E.M.M., xvi, 175.
(4) Gastrodes abietis in Morayshire, E.M.M., xvi, 214.
(5) Additions to the Morayshire Hemiptera, E.M.M., xviii, 18.
(6) Additions to the Perthshire Hemiptera, E.M.M., xviii, 276.

Nowicki, M. Miris dolobratus attacking dipteron, Verh. zool. bot. Ges. Wien., xxi, 52.

Osborn, H. The meadow plant bug, Miris dolabratus, Journ. Agr. Res. Washington, 1918.

Oshanin, B.—
(1) Verzeichnis der Palaearktischen Hemipteren, 1906.
(2) Katalog der Palaearktischen Hemipteren, 1912.

Packard, A. S. Guide to the study of Insects, 1889.
Parfitt, E. Fauna of Devon, Hemiptera-Heteroptera, Dev. Ass. Adv. Sc., 1884, 749.
Parshley, H. M.—
(1) On some Hemiptera from Western Canada, Occ. Papers Mus. Zool. Univ. Michigan, No. 71.
(2) Hemiptera from Peaks Isle, Maine, Can. Ent., lii, 80.
(3) An instance of miscegenation in the Gerridae, An. Soc. Ent. Belg., lxi, 42.
(4) On the genus Microvelia Westwod, Bull. Brookl. Ent. Soc. xvi, 57.
(5) Essay on the American species of Aradus, Trs. Amer. Ent. Soc., xlvii, 1–106.
Perkins, V. R. Early Hymenoptera and Hemiptera, E.M.M., xxviii, 135.
Pickard-Cambridge, A. W. Coleoptera and Hemiptera in the Highlands, E.M.M., lvi, 45.
Pierre, l'Abbé. Note sur les moeurs d'Elasmostethus griseus, L., interstinctus, Reut., Bull. Soc. Ent. Fr., 1903.
Pierret, E. C.R. Soc. Ent. Belg., 1875.
Piffard, A.—
(1) Pionosomus varius, Wolff, at Deal, E.M.M., xxvi, 221.
(2) Capture of some Hemiptera and Coleoptera in 1890, E.M.M., xxvi, 296.
Pissot, E. Parasite in Pentatoma dissimilis, Latr., Bull. Soc. Ent. Fr., 1888, cxcv.
Poppius, B., and Bergroth, E. Beiträge zur Kenntnis der Myrmecoiden Heteropteren, An. Mus. Nat. Hung., 1920–1.
Poujade, G. A. Attitude des Insectes pendant le vol., Ann. Soc. Ent. Fr., 1888, 197.
Poulton, E. B. Predaccous insects and their prey, Tr. Ent. Soc. Lond., 1906.
Puton, A.—
(1) Pilophorus and ants, Bull. Soc. Ent. Fr., 1877, cxxx.
(2) Note sur l'habitat des Tingides, Petites Nouvelles Ent., 226.
(3) Synopsis des Hémiptères-Hétéroptères de France, 1878.
(4) Catalogue des Hémiptères de la Faune Palaearctique, 1899.

Rambur, M. P. Faune entomologique d'Andalousie, 1842.
Redfern, P. On the method of production of sound by a species of Notonecta, Rep. Brit. Ass., 1859.
Reuter, O. M.—
(1) Revisio critica Capsinarum, 1875.
(2) Hemiptera Gymnocerata Scandinaviae et Fennicae, Pt. I, Capsina, Act. Soc. Sc. Fenn., 1875.
(3) Note on Gerris thoracica, E.M.M., xii, 67.
(4) Captures of Hemiptera-Heteroptera in Scotland, E.M.M., xiv, 186.
(5) Til Kännedomen om mimiska Hemiptera och deras lefnads historia, Ofv. Finsk. Vet. Soc. Förh., 1878–9.
(6) Remarks on some British Hemiptera-Heteroptera, E.M.M., xv, 66.
(7) Nya bidrag till Åbo och Ålands skärgårds Hemipter-fauna, Med. Soc. Faun. et Flor. Fenn., 1880.

Reuter, O. M.—(*continued*)—
(8) Remarks on some British Hemiptera-Heteroptera, E.M.M., xvi, 12, 172.
(9) Analecta hemipterologica, B.E.Z., xxv, 1881.
(10) Remarks on some British Hemiptera-Heteroptera, E.M.M., xvii, 10.
(11) Monographia Ceratocombidarum, Act. Soc. Sc. Fenn., xix (6), 1882.
(12) Hemiptera Gymnocerata Europae, Act. Soc. Sc. Fenn., 1884, etc.
(13) Monographia Anthocoridarum, Act. Soc. Sc. Fenn., 1884.
(14) The British species of Dicyphus, E.M.M., xx, 49.
(15) The European species of the genus Clinocoris Hahn., Stål., E.M.M., xxii, 37.
(16) On the food of Capsidae, E.M.M., xxxix, 121.
(17) Uebersicht der paläarktischen Stenodema-Arten, Ofv. Finsk. Vet. Soc. Förh., 1903–04.
(18) Hemipterologische Spekulationen, ii, Fest. f. Palmen., 1905 (2).
(19) Charakteristik und Entwickelungsgeschichte der Hemipteren Fauna der Palaearktischen Coniferen, 1908.
(20) Bemerkungen über Nearktische Capsiden, Act. Soc. Sc. Fenn., xxxvi (2), 1909.
(20a) On the Nomenclature of some (British) Hemiptera-Heteroptera, E.M.M., xliv, 22.
(21) Neue Beiträge zur Phylogenien und Systematik der Miriden, Act. Soc. Sc. Fenn., xxxvii (3), 1910.
(22) Studien über die paläarktischen Formen der Hemipteren-Gattung Notostira, Fieb., Rev. Rus. d'Ent., 1911 (3).
(23) Bemerkungen über mein neues Heteropterensystem, Ofv. Finsk. Vet. Soc. Förh., 1911–12 (6).
(24) Hemipterologische Miscellen., Ofv. Finsk. Vet. Soc. Förh., 1911–12 (7).
(25) Die Familie der Bett- oder Hauswanzen, ihre Phylogenie, Systematik, Oekologie, und Verbreitung, Zeit. Wiss. Ins. Biol.

Rey, Cl. Notes sur quelques Hémiptères, Rev. d'Ent., 1888, vii, 102.
Ribaga, A. Sopra un organo partiolare delle Cimici dei letti, 1897.
Richardson, N. M. The migration of aquatic Hemiptera, E.M.M., xliii, 105.
Royer, J. M. Sur l'habitat des Spathocera (3 spp.), Bull. Soc. Ent. Fr., 1905.
Rye, E. C. Hemiptera at Folkestone, E.M.M., vi, 183.
Ryles, W. E. Coleoptera and Hemiptera in the New Forest, E.M.M., xxxvi, 262.

Sahlberg, J.—
(1) Enumeratio Hemipterorum gymnoceratorum Fenniae, Med. Soc. Faun. Fl. Fenn., vii, 1881.
(2) Ditto, 2nd and revised edition, 1920.

Sahlberg, R. F. Monographia Geocorisarum Fenniae, 1848.

Saunders, E.—
(1) New British Hemiptera, Ent., v, 252.
(2) Descriptions of two species of Hemiptera new to the British list, and notice of a third, E.M.M., vii, 156.
(3) Notes on British Hemiptera, E.M.M., viii, 110.
(4) Notes on a British Bug, E.M.M., x, 91, 165.
(5) Synopsis of British Hemiptera-Heteroptera, Tr. Ent. Soc. Lond., 1875–6.
(6) Description of an additional species to the list of British Hemiptera, E.M.M., xii, 131.
(7) British Hemiptera. Description of Sehirus picipes, a new British species, E.M.M., xii, 154.

SAUNDERS, E.—(*continued*)—
(8) An addition to the list of British Hemiptera, E.M.M., xiii, 186.
(9) Captures of rare Coleoptera, Hemiptera, and Hymenoptera at Chobham, E.M.M., xiii, 113.
(10) Description of three Hemiptera new to the British list, E.M.M., xiii, 249.
(11) Lopus sulcatus at Hayling Island, E.M.M., xiv, 70.
(12) British Hemiptera-Heteroptera, an additional species, E.M.M., xiv, 105.
(13) Notes on Hemiptera taken at Southwold, E.M.M., xiv, 164.
(14) Note on the British species of Pilophorus, E.M.M., xv, 277.
(15) Description of an additional species to the list of British Hemiptera, E.M.M., xvi, 98.
(16) An addition to the list of British Hemiptera, E.M.M., xvi, 122.
(17) Notes on Hymenoptera and Hemiptera captured at Chobham, E.M.M., xvii, 68.
(18) Captures of British Hemiptera-Heteroptera, E.M.M., xvii, 165.
(19) Hymenoptera and Hemiptera at Deal in July and August, 1882, E.M.M., xix, 85.
(20) Notes on British Hemiptera, E.M.M., xix, 189.
(21) Local Hemiptera at Bromley, E.M.M., xxiv, 91.
(22) Addition to the list of British Hemiptera, E.M.M., xxv, 34.
(23) Macropterous form of Ischnocoris hemipterus, etc., E.M.M., xxv, 35.
(24) Addition to the list of British Hemiptera, E.M.M., xxv, 78.
(25) Notes on British Hemiptera. The British species of Scolopostethus, etc., E.M.M., xxv, 148.
(26) Notes on Mr. Edwards' paper on Scolopostethus, E.M.M., xxv, 295.
(27) Addition to the list of British Hemiptera, E.M.M., xxvi, 206.
(28) Addition to the list of British Hemiptera, E.M.M., xxvii, 298.
(29) The Hemiptera-Heteroptera of the British Islands, 1892.
(30) Two new British Hemiptera, E.M.M., xxviii, 8.
(31) Note on Orthotylus ochrotrichus, D. and S., E.M.M., xxviii, 125.
(32) Psallus albicinctus, Kbm., a new British species of Hemiptera, E.M.M., xxviii, 258.
(33) Rare Hemiptera at Chobham and Surbiton, E.M.M., xxviii, 290.
(34) Psallus albicinctus, Kbm., E.M.M., xxviii, 310.
(35) An addition to the list of British Hemiptera, E.M.M., xxx, 254.
(36) Hemiptera near Leicester, E.M.M., xxxi, 97.
(37) Salda mülleri, Gmelin, an addition to the list of British Hemiptera, with notes of allied species, E.M.M., xxxi, 236.
(38) Female of Megaloceræa erratica dimorphic, E.M.M., xxxiii, 15.
(39) Scolopostethus grandis, Horv., at Tunbridge Wells, E.M.M., xxxiv, 138.
(40) Xylocoridea brevipennis, Reuter, a new genus and species to the list of British Hemiptera, E.M.M., xxxiv, 251.
(41) Scolopostethus puberulus, Horv., and other Hemiptera at Seaton, Devon, E.M.M., xxxv, 147.
(42) Aethus flavicornis, Fab., a genus and species new to the list of British Hemiptera, E.M.M., xxxv, 155.
(43) Hymenoptera and Hemiptera at Harting, Sussex, E.M.M., xxxvi, 14.
(44) Peribalus vernalis, Wolff, in Slindon Woods, Sussex, E.M.M., xxxvi, 132.
(45) Nabis brevis Scholtz, an addition to the British Hemiptera, E.M.M., xxxvi, 227.
(46) Balearic Insects, Hemiptera-Heteroptera, E.M.M., xxxvii, 239.

SAUNDERS, E.—(*continued*)—
(47) Nabis brevis Scholtz, and other Hemiptera at Woking, E.M.M., xxxviii, 269.
(48) Myrmecoris gracilis, Sahlb., an addition to the British Hemiptera, E.M.M., xxxix, 269.
(49) Corizus hyalinus, Fab., an addition to the British Hemiptera, E.M.M., xxxix, 294.
(50) Elasmostethus ferrugatus, F., in Derbyshire, E.M.M., xl, 38.
(51) Orthostira nigrina, Fall. (macropterous) in Somersetshire, E.M.M., xl., 38.
(52) Hymenoptera and Hemiptera in the Mendips, E.M.M., xli, 212.
(53) Additions to the list of British Hemiptera since 1892, E.M.M., xliii, 196.
(54) Sehirus morio, L., and luctuosus, M. and R., E.M.M., xliv, 113.
(55) Notochilus hamulatus, Thoms., an addition to the list of British Hemiptera, E.M.M., xliv, 252.
(56) The macropterous and brachypterous forms of Drymus brunneus and sylvaticus, E.M.M., xliv, 257.
(57) Myrmecoris gracilis in the nest of Formica rufa, E.M.M., xlv, 271.
SAUNDERS, E., and EDWARDS, J. Catalogue of British Hemiptera, 1908.
SAUNDERS, H. A.—
(1) Anthocoris limbatus, Fieb., an addition to the British Hemiptera, E.M.M., xliii, 233.
(2) Hemiptera in Surrey and Dorsetshire, E.M.M., xlvii, 94.
(3) Hemiptera in Dorset and Surrey, E.M.M., xlviii, 13.
SCHILLING, P. S. Hemiptera-Heteroptera Silesiae, 1829.
SCHMIDT-SCHWEDT, E. In Zacharias Tier- und Pflanzenwelt des Susswassers, 1891.
SCHOUTEDEN, H. Scutellerinae, Graphosomatinae, and Asopinae, Wytsman's Genera Insectorum.
SCHUMACHER, F.—
(1) Beiträge zur Kenntnis der Biologie der Asopiden, Zeit. Wiss. Ins. Biol., vi, vii.
(2) Ueber einige Heteroptero-Cecidien, Zeit. Wiss. Ins. Biol., 1909.
(3) Beiträge zur Kenntnis der Verbreitung und Biologie der einheimischen Poeciloscytus-Arten, Zeit. Wiss. Ins. Biol., 1909.
(4) Beiträge zur Kenntnis der Hemipteren-Fauna Deutschlands ii, Ent. Rundsch., 1911.
(5) Beiträge zur Kenntnis der Rhynchotenfauna Deutschlands iii, Deut. Ent. Zeit., 1911.
(6) Die Rhynchoten-Fauna der Mark Brandenburg, B.E.Z., 1911, 1912.
(7) Heteroptera gesammelt von Embr. Strand, Nyt. Mag. for Naturvidenskaberne, 1912.
(8) Ueber die Zusammensetzung der Hemipteren-Fauna einiger deutschen Heideformationen, insbesondere der Binnendünen, Sandfelder und trockenen Kiefernwälder, Sitz. Ges. Nat. Fr., 1912 (8).
SCHUMMEL, T. E. Ploteres, 1832.
SCOTT, J. Note on Pentatoma juniperina, E.M.M., 1873.
SHARP, D. Cambridge Natural History, Insecta, 1899.
SHARP, W. E.—
(1) Elasmostethus ferrugatus, Fab., in Wales, E.M.M., xxxvi, 131.
(2) Notes on the Coleoptera of Crowthorne, E.M.M., lii, 86, 131.
SIMS, H. T. Reduvius personatus at Lincoln, E.M.M., xxii, 115.

Snellen van Vollenhoven, S. C. Hemiptera-Heteroptera Neerlandica. De Inlandsche ware Hemipteren, 1878.

Soar, C. D.—
- (1) Note on the Occurrence of Larval Water-mites on various aquatic animals, Journ. Quek. M.C., 1901.
- (2) Notes and observations on the Life History of Fresh-water mites, Journ. Quek. M.C., 1906.

Southall, J. A Treatise of Buggs, 1730.

Spinola, M. Essai sur les Insectes Hémiptères, 1840.

Swale, H. Hymenoptera and Hemiptera in June, 1893, at Saunton Sands, N. Devon, and Morthoe, E.M.M., xxix, 262.

Swinton, A. H. Stridulation in Hemiptera, E.M.M., xiv, 29.

Taylor, J. Kidson. Hemiptera in Miller's Dale, Buxton, and Sherwood Forest, E.M.M., xli, 27.

Theobald, F. V.—
- (1) On some hop-pests, E.M.M., xxxii, 60.
- (2) The Cimex in the nests of domestic fowls, E.M.M., xxxiii, 185.
- (3) Notes on the Needle-nosed Hop Bugs, Journ. S.E. Agr. Coll.

Thornley, Rev. A. Entomology in the New Forest during August, 1898, E.M.M., xxxv, 112.

Thouless, H. J.—
- (1) The habitat of Phytocoris distinctus, E.M.M., xxii, 141.
- (2) Poeciloscytus vulneratus, an addition to the list of British Hemiptera, E.M.M., xxxiv, 15.
- (3) Pseudophloeus waltlii, H.S., a species new to the British Fauna, E.M.M., xxxviii, 80.
- (4) Corizus hyalinus at Norwich, E.M.M., xl, 16.

Tomlin, J. R. Le B. Aëpophilus bonnairei, Sign., at Sennen Cove, E.M.M., li, 169.

Tottenham, H. R. Hemiptera from Cambridgeshire, E.M.M., xliv, 275.

Tuck, W. H. Inquiline and other inhabitants in nests of aculeate Hymenoptera, E.M.M., xxxii, 153.

Tullgren, A. Zur Morphologie und Systematik der Hemipteren I, Särt. Ent. Tidsk., 1918.

Ussing, H. Beiträge zur Biologie der Wasserwanze Aphelochirus montandoni, Horváth.

Verhoeff, C.—
- (1) Capsus capillaris, F., ein Aphidien-Feind., Ent. Nach., 1891, 26.
- (2) Zur Lebensgeschichte des Theridium sisyphium, Clerk, Ent. Nach., 1891, 51.

Victoria County Histories. Berks, Bucks, Cornwall, Cumberland, Derby, Devon, Essex, Hants, Kent, Lancs, Leicester, Notts, Rutland, Somerset, Staffs, Surrey, Sussex, Warwick.

Walker, J. J.—
- (1) Gnathoconus picipes, Fall., at Great Yarmouth, E.M.M., xxxi, 282.
- (2) Reoccurrence of Pionosomus varius, Wolff, at Deal, E.M.M., xxxiv, 209.
- (3) Coleoptera, etc., at Chippenham and Wicken Fen, E.M.M., xxxiv, 221.
- (4) The Coleoptera and Hemiptera of the Deal Sandhills, E.M.M., xxxvi, 94.

Walker, J. J.—(*continued*)—
(5) Lygaeus equestris, L., in the Isle of Sheppey, E.M.M., xlii, 258.
(6) Metatropis rufescens, H.S., in the New Forest, E.M.M., xliv, 186.
(7) Notochilus limbatus, Fieb., in the New Forest, E.M.M., lii, 186.
(8) The New Forest, June, 1917, E.M.M., liii, 169.
Wallis, T. E. Mexican Insects in Poultry Food, The Analyst, Aug., 1919.
Waterfall, W. B. Aëpophilus bonnairei on the North Devon coast, E.M.M., xxxviii, 9.
Waterhouse, C. O. Note on Aëpophilus bonnairei, Signoret, a genus and species of Hemiptera new to Britain, E.M.M., xviii, 145.
Wefelscheid, H. Ueber die Biologie und Anatomie von Plea, Zool. Jahrb., 1912.
West, W. Proceedings of S. London Entomological Society, passim.
Westwood, J. O.
(1) The Modern Classification of Insects.
(2) On the connecting links between the Geocorisae and Hydrocorisae of Latreille, or the Land and Water Bug Tribes, Loud. Mag. Nat. Hist., 1833, 228.
White, F. Buchanan—
(1) Note on Aetorhinus bilineatus, Fallen, E.M.M., vi, 9.
(1a) Hemiptera in Strathglass, E.M.M., vii, 82.
(2) On Eremocoris fenestratus, H.S., E.M.M., viii, 98.
(3) On the strigils of Corixa, E.M.M., x, 60.
(4) Life History of Corixa, E.M.M., x, 78.
(5) Description of new Anthocoridae, E.M.M., xvi, 142.
(6) Notes on Scottish Hemiptera, Scot. Nat. i, 223.
(7) Contributions to a knowledge of the Hemipterous Fauna of St. Helena, and speculations as to its origin.
Whittaker, O.—
(1) A preliminary Catalogue of the Hemiptera-Heteroptera of Lancashire and Cheshire, Proc. Lanc. and Ches. Ent. Soc., 1906.
(2) Gerris canalium, Duf (=najas of authors), E.M.M., xlii, 138.
Wolff, J. F. Icones Cimicum, 1800–11.
Wood, Rev. Theodore. Note on Nepa cinerea, E.M.M., xxi, 20.
Wright, A. Velia rivulorum and currens, Loud. Mag. Nat. Hist., 1831.

Xambeu, V. Moeurs et metamorphoses des Insectes, Ann. Soc. Lin. Lyon, 1904, etc.

Zetterstedt, J. W. Insecta Lapponica, 1840.

LIST OF BRITISH HEMIPTERA-HETEROPTERA

ARRANGED ACCORDING TO

Oshanin's "Katalog der paläarktischen Hemipteren" (1912).

N.B.—The numbers in this List do not correspond to those in the text.

POLYNEURIA Reut.

Superf. Pentatomoideae Reut.

Fam. 1. **CYDNIDAE** Billb.

THYREOCORIS Schr.
  1. scarabaeoides L.
CYDNUS F.
  2. flavicornis F.
GEOTOMUS M. R.
  3. punctulatus Costa.
GNATHOCONUS Fieb.
  4. albomarginatus Goeze.
  5. picipes Fall.
SEHIRUS A. S.
  6. luctuosus M. R.
  7. bicolor L.
  8. dubius Scop.
  9. biguttatus L.

Fam. 2. **PENTATOMIDAE** Leach.

Subf. **Scutellerinae** Lap.

Trib. *ODONTOSCELARIA* Stål.

ODONTOSCELIS Lap.
  10. fuliginosa L.
  11. dorsalis F.

Trib. *EURYGASTRARIA* Stål.

EURYGASTER Lap.
  12. austriacus Schrk.
    var. *frischii* Goeze.
  13. maurus L.

Trib. *PODOPARIA* Stål.

PODOPS Lap.
  14. inuncta F.

Subf. **Pentatominae** Stål.

Trib. *SCIOCORARIA* Stål.

SCIOCORIS Fall.
  15. cursitans F.

Trib. *PENTATOMARIA* Stål.

AELIA F.
  16. acuminata L.
NEOTTIGLOSSA Kirby.
  17. pusilla Gmel.
EUSARCORIS Hhn.
  18. aeneus Scop.
  19. melanocephalus F.
PERIBALUS M. R.
  20. vernalis Wolff.
PALOMENA M. R.
  21. prasina L.
CHLOROCHROA Stål.
  22. juniperina L.
CARPOCORIS Klt.
  23. fuscispinus Boh.
DOLYCORIS M. R.
  24. baccarum L.
EURYDEMA Lap.
  25. dominulus Scop.
  26. oleraceum L.
PIEZODORUS Fieb.
  27. lituratus F.
PENTATOMA Ol.
  28. rufipes L.

Subf. **Acanthosominae.**

ACANTHOSOMA Curt.
  29. haemorrhoidale L.
ELASMOSTETHUS Fieb.
  30. interstinctus L.
ELASMUCHA Stål.
  31. ferrugata F.
  32. grisea L.
CYPHOSTETHUS Fieb.
  33. tristriatus F.

Subf. **Asopinae** Dall.

PICROMERUS A. S.
  34. bidens L.

Troilus Stål.
35. luridus F.
Rhacognathus Fieb.
36. punctatus L.
Jalla Hhn.
37. dumosa L.
Zicrona A. S.
38. coerulea L.

Superf. Coreoideae Reut.

Fam. 3. **COREIDAE** Leach.

Subf. **Coreinae** Ståll.

Trib. *GONOCERARIA* Stål.

Gonocerus Latr.
39. acuteangulatus Goeze.

Trib. *COREARIA* Stål.

Verlusia Spin.
40. rhombea L.
Coreus F.
41. scapha F.
Syromastes Latr.
42. marginatus L.

Trib. *SPATHOCERARIA* Osh.

Spathocera Stein.
43. dalmani Schill.

Subf. **Pseudophloeinae** Stål.

Pseudophloeus Burm.
44. falleni Schill.
45. Waltli H. S.
Bathysolen Fieb.
46. nubilus Fall.
Ceraleptus Costa.
47. lividus Stein.
Coriomeris Westw.
48. denticulatus Scop.

Subf. **Alydinae** Stål.

Trib. *STENOCEPHALARIA* Stål.

Stenocephalus Latr.
49. medius M. R.
50. agilis Scop.
51. albipes F.

Trib. *ALYDARIA* Stål.

Alydus F.
52. calcaratus L.

Subf. **Corizinae** Stål.

Therapha A. S.
53. hyosciami L.
Liorhyssus Stål.
54. hyalinus F.
Corizus Fall.
55. maculatus Fieb.
56. subrufus Gmel.
57. parumpunctatus Schill.
58. rufus Schill.
Stictopleurus Stål.
59. crassicornis L.
60. abutilon Rossi.
Myrmus Hhn.
61. miriformis Fall.
Chorosoma Curt.
62. schillingi Schill.

ONYCHIOPHORA Reut.

Superf. Lygaeoideae Osh.

Phalanx *PYRRHOCORIFORMES* Reut.

Fam. 4. **PYRRHOCORIDAE** Fieb.

Subf. **Pyrrhocorinae** Dhrn.

Pyrrhocoris Fall.
63. apterus L.

Phalanx *LYGAEIFORMES* Osh.

Fam. 5. **LYGAEIDAE** Schill.

Subf. **Lygaeinae** Stål.

Trib. *LYGAEARIA* Stål.

Spilostethus Stål.
64. equestris L.

Trib. *ORSILLARIA* Stål.

Nysius Dall.
65. thymi Wolff.
66. lineatus Costa.

Subf. **Cyminae** Stål.

Trib. *CYMARIA* Stål.

Cymus Hhn.
67. claviculus Fall.
68. melanocephalus Fieb.
69. glandicolor Hhn.
70. obliquus Horv.

Trib. *ISCHNORHYNCHARIA* Stål.

Ischnorhynchus Fieb.
71. resedae Panz.
72. ericae Horv.

Subf. **Blissinae** Stål.

Ischnodemus Fieb.
73. sabuleti Fall.

Subf. **Henestarinae** Stål.

Henestaris Spin.
74. laticeps Curt.
75. halophilus Burm.

Subf. **Artheneinae** Stål.

Chilacis Fieb.
76. typhae Perr.

Subf. **Heterogastrinae** Stål.

Heterogaster Schill.
77. artemisiae Schill.
78. urticae F.

Subf. **Aphaninae** Leth. Sev.

Trib. *PLOCIOMERARIA* Put.

Pamera Say.
79. fracticollis Schill.
80. lurida Hhn.

Trib. *RHYPAROCHROMARIA* Stål.

Rhyparochromus Curt.
81. antennatus Schill.
82. praetextatus H. S.
83. dilatatus H. S.
84. chiragra F.
var. *nigricornis* Doug.
var. *sabulicola* Thms.

Tropistethus Fieb.
85. holosericeus Schltz.
Ischnocoris Fieb.
86. angustulus Boh.
Macrodema Fieb.
87. micropterum Curt.
Pionosomus Fieb.
88. varius Wolff.
Plinthisus Fieb.
89. brevipennis Latr.
Lasiosomus Fieb.
90. enervis H. S.
Acompus Fieb.
91. rufipes Wolff.
Stygnocoris D.& S.
92. rusticus Fall.
93. pedestris Fall.
94. fuligineus Geoffr.
Peritrechus Fieb.
95. sylvestris F.
96. geniculatus Hhn.
97. gracilicornis Put.
98. nubilus Fall.

Trib. *APHANARIA* Dist.

Trapezonotus Fieb.
99. distinguendus Flor.
100. arenarius L.
101. dispar Stål.
102. ullrichi Fieb.
Calyptonotus D.& S.
103. rolandri L.

Aphanus Lap.
Subg. graptopeltus Stål.

104. lynceus F.

Subg. xanthochilus Stål.

105. quadratus L.

Subg. aphanus Put.

106. alboacuminatus Goeze.
107. pini L.
Beosus A. S.
108. maritimus Scop.

Trib. *GONIONOTARIA* Stål.

Emblethis Fieb.
109. verbasci F.
Drymus Fieb.
110. pilipes Fieb.
111. pilicornis Mls.
112. confusus Horv.
113. sylvaticus F.
var. *ryei* Saund.

114. brunneus Sahlb.
115. piceus Flor.
Eremocoris Fieb.
116. plebejus Fall.
117. podagricus F.
118. fenestratus H. S.
Scolopostethus Fieb.
119. pictus Schill.
120. grandis Horv.
121. affinis Schill.
122. thomsoni Reut.
123. decoratus Hhn.
124. puberulus Horv.
Taphropeltus Stål.
125. contractus H. S.
126. hamulatus Hhn.
127. limbatus Fieb.
Gastrodes Westw.
128. abietis L.
129. ferrugineus L.

Fam. 6. **BERYTIDAE** Fieb.

Trib. *BERYTARIA* Put.

Neides Latr.
130. tipularius L.
Berytus F.
131. clavipes F.
132. minor H. S.
133. montivagus Mey.
134. signoreti Fieb.
135. crassipes H. S.

Trib. *METACANTHARIA* Put.

Metatropis Fieb.
136. rufescens H. S.
Metacanthus Costa.
137. punctipes Germ.

Superf. Tingitorideae Reut.

Fam. 7. **PIESMIDAE** A. S.

Piesma Le P. S.
138. maculata Lap.
139. quadrata Fieb.

Fam. 8. **TINGITIDAE** Costa.

Trib. *TINGITARIA* Stål.

Campylsotira Fieb.
140. verna Fall.
Acalypta Westw.
141. brunnea Germ.
142. carinata Panz.
143. platychila Fieb.
144. nigrina Fall.
145. marginata Wolff.
146. parvula Fall.
Dictyonota Curt.
147. strichnocera Fieb.
148. fuliginosa Costa.
149. tricornis Schrk.
Derephysia Spin.
150. foliacea Fall.
Lasiacantha Stål.
151. capucina Germ.
Tingis F.

Subg. lasiotropis Stål.

152. reticulata H. S.

Subg. tingis F.

153. ampliata H. S.
154. cardui L.
155. angustata H. S.
Catoplatus Spin.
156. fabricii Stål.
Physatochila Fieb.
157. dumetorum H. S.
158. quadrimaculata Wolff.
Oncochila Stål.
159. simplex H. S.
Monanthia Le P. S.
160. humuli F.

Trib. *SERENTHIARIA* Stål.

Serenthia Spin.
161. laeta Fall.

PHLOEOBIOTICA Reut.

Superf. Aradoideae Reut.

Fam. 9. **ARADIDAE** Costa.

Aradus F.
162. depressus F.
163. aterrimus Fieb.
164. corticalis L.
165. betulae L.

Fam. 10. **DYSODIIDAE** Reut.

Aneurus Curt.
166. laevis F.
167. avenius Duf.

ANONYCHIA Reut.

Superf. Reduvioideae Reut.

Phalanx *REDUVIIFORMES* Reut.

Fam. 11. **REDUVIIDAE** Latr.

Subf. **Emesinae** A. S.

Trib. *STENOLEMARIA* Dist.

Ploiariola Reut.
168. vagabunda L.
169. culiciformis De G.
170. baerensprungi Dhrn.

Subf. **Stenopodinae** Stål.

Pygolampis Germ.
171. bidentata Goeze.

Subf. **Reduviinae** Reut.

Reduvius F.
172. personatus L.

Subf. **Harpactorinae** Reut.

Coranus Curt.
173. subapterus De G.

Phalanx *NABIFORMES* Reut.

Fam. 12. **NABIDAE** Costa.

Subf. **Prostemminae** Reut.

Prostemma Lap.
174. guttula F.

Subf. **Nabinae** Reut.

Nabis Latr.

Subg. nabis Latr.

175. apterus F.
176. lativentris Boh.
177. major Costa.

Subg. stålia Reut.

178. boops Schiödte.

Subg. DOLICHONABIS Reut.

179. limbatus Dhlb.
180. lineatus Dhlb.

Subg. REDUVIOLUS Stål.

181. flavomarginatus Schltz.
182. ferus L.
183. rugosus L.
184. ericetorum Schltz.
185. brevis Schltz.

Phalanx *HEBRIFORMES* Osh.

Fam. 13. **HEBRIDAE** Fieb.

HEBRUS Curt.
186. pusillus Fall.
187. ruficeps Thoms.

Fam. 14. **MESOVELIIDAE** D. & S.

MESOVELIA Muls.
188. furcata Mls.

Superf. Cimicoideae Reut.

Phalanx *CIMICIFORMES* Reut.

Fam. 15. **CIMICIDAE** Latr.

CIMEX L.
189. lectularius L.
190. columbarius Jenyns.
191. pipistrelli Jenyns.
192. dissimilis Horv.
OECIACUS Stål.
193. hirundinis Jenyns.

Fam. 16. **ANTHOCORIDAE** A. S.

Trib. *ANTHOCORARIA* Reut.

TEMNOSTETHUS Fieb.
194. pusillus H. S.
ELATOPHILUS Reut.
195. nigricornis Zett.
ANTHOCORIS Fall.
196. confusus Reut.
197. nemoralis F.
var. *austriacus* F.
var. *superbus* Westh.
198. sarothamni D. & S.
199. visci Doug.
200. gallarum-ulmi De G.
201. nemorum L.
202. limbatus Fieb.
TETRAPHLEPS Fieb.
203. bicuspis H. S.
ACOMPOCORIS Reut.
204. alpinus Reut.
205. pygmaeus Fall.
TRIPHLEPS Fieb.
206. nigra Wolff.
207. majuscula Reut.
208. minuta L.

Trib. *LYCTOCORARIA* Reut.

LYCTOCORIS Hhn.
209. campestris F.
PIEZOSTETHUS Fieb.
210. galactinus Fieb.
211. formicetorum Boh.
212. cursitans Fall.
BRACHYSTELES Muls.
213. parvicornis Costa.
CARDIASTETHUS Fieb.
214. fasciiventris Garb.
XYLOCORIDEA Reut.
215. brevipennis Reut.
XYLOCORIS Duf.
216. ater Duf.

Fam. 17. **MICROPHYSIDAE** Dhrn.

MICROPHYSA Westw.
217. pselaphiformis Curt.
218. elegantula Baer.
MYRMEDOBIA Baer.
219. tenella Zett.
220. distinguenda Reut.
221. inconspicua D. & S.
222. coleoptrata Fall.

Phalanx *CAPSIFORMES* Osh.

Fam. 18. **CAPSIDAE** Burm.

Subf. **Capsinae** Osh.

Trib. *CAPSARIA* Reut.

MYRMECORIS Gorski.
223. gracilis Sahlb.
PITHANUS Fieb.
224. maerkeli H. S.
PANTILIUS Curt.
225. tunicatus F.
MIRIDIUS Fieb.
226. quadrivirgatus Costa.
PHYTOCORIS Fall.
227. tiliae F.
var. *marmoratus* D.& S.
228. longipennis Flor.
229. populi L.
var. *distinctus* D.& S
230. dimidiatus Kb.
231. reuteri Saund.
232. pini Kb.
233. ulmi L.
234. varipes Boh.

MEGACOELUM Fieb.
235. infusum H. S.
236. beckeri Fieb.
ADELPHOCORIS Reut.
237. seticornis F.
238. ticinensis Mey.
239. lineolatus Goeze.
CALOCORIS Fieb.
240. ochromelas Gmel.
241. sexguttatus F.
242. fulvomaculatus De G.
243. alpestris Mey.
244. norvegicus Gmel.
HOMODEMUS Fieb.
245. M-flavum Goeze.
PYCNOPTERNA Fieb.
246. striata L.
STENOTUS Jak.
247. binotatus F.
DICHROOSCYTUS Fieb.
248. rufipennis Fall.
249. valesianus Fieb.
LYGUS Hhn.

Subg. LYGOCORIS Reut.

250. pabulinus L.

Subg. LYGUS Reut.

251. viridis Fall.
252. contaminatus Fall.
253. spinolae Mey.
254. lucorum Mey.
255. limbatus Fall.
256. pratensis L.
257. atomarius Mey.
258. rubricatus Fall.
259. cervinus H. S.

Subg. ORTHOPS Fieb.

260. viscicola Put.
261. campestris L.
262. kalmi L.

Subg. AGNOCORIS Reut.

263. rubicundus Fall.
PLESIOCORIS Fieb.
264. rugicollis Fall.
CAMPTOZYGUM Reut.
265. pinastri Fall.
POECILOSCYTUS Fieb.
266. unifasciatus F.
267. palustris Reut.
268. vulneratus Panz.
POLYMERUS Westw.
269. nigrita Fall.

CHARAGOCHILUS Fieb.
270. gyllenhali Fall.
LIOCORIS Fieb.
271. tripustulatus F.
CAMPTOBROCHIS Fieb.
272. lutescens Schill.
DERAEOCORIS Kb.
273. ruber L.
CAPSUS F.
274. ater L.

Trib. *RESTHENIARIA* Reut.

LOPUS Hhn.
275. flavomarginatus Don.
276. sulcatus Fieb.
277. gothicus L.
var. *superciliosus* L.

Trib. *MIRARIA* Reut.

ACETROPIS Fieb.
278. gimmerthali Flor.

STENODEMA Lap.

Subg. BRACHYTROPIS Fieb.

279. calcaratum Fall.

Subg. STENODEMA Lap.

280. laevigatum L.
281. holsatum F.
NOTOSTIRA Fieb.
282. erratica L.
283. tricostata Costa.
MEGALOCERAEA Fieb.
284. linearis Fuessl.
TRIGONOTYLUS Fieb.
285. ruficornis Geoffr.
286. psammaecolor Reut.
TERATOCORIS Fieb.
287. antennatus Boh.
288. viridis D. & S.
289. saundersi D. & S.
MIRIS F.
290. dolobratus L.
291. ferrugatus Fall.

Subf. **Bothynotinae** Reut.
Trib. *BOTHYNOTARIA* Reut.

BOTHYNOTUS Fieb.
292. pilosus Boh.

Subf. **Bryocorinae** Reut.
Trib. *BRYOCORARIA* Reut.

MONALOCORIS Dahlb.
293. filicis L.
BRYOCORIS Fall.
294. pteridis Fall.

Subf. **Dicyphinae** Bh.
Trib. *DICYPHARIA* Reut.

Macrolophus Fieb.
295. nubilus H. S.
Dicyphus Fieb.
296. constrictus Boh.
297. epilobii Reut.
298. errans Wolff.
299. stachydis Reut.
300. pallidicornis Fieb.
301. globulifer Fall.
302. annulatus Wolff.
Campyloneura Fieb.
303. virgula H. S.

Trib. *CREMNOCEPHALARIA* Reut.

Allodapus Fieb.
304. rufescens Burm.
Systellonotus Fieb.
305. triguttatus L.

Subf. **Cyllocorinae** Osh.
Trib. *CYLLOCORARIA* Reut.

Pilophorus Westw.
306. cinnamopterus Kb.
307. clavatus L.
308. perplexus D. & S.
Cyllocoris Hhn.
309. histrionicus L.
310. flavoquadrimaculatus De G.
Blepharidopterus Klti.
311. angulatus Fall.
Globiceps Le P. S.
312. cruciatus Reut.
313. flavomaculatus F.
314. dispar Boh.
Mecomma Fieb.
315. ambulans Fall.
Cyrtorrhinus Fieb.
316. caricis Fall.
317. geminus Flor.
318. pygmaeus Zett.
319. flaveolus Reut.
Orthotylus Fieb.
320. fuscescens Kb.
321. bilineatus Fall.
322. virens Fall.
323. flavinervis Kb.
324. marginalis Reut.
325. tenellus Fall.
326. nassatus F.
327. viridinervis Kb.
328. prasinus Fall.
329. scotti Reut.
330. ochrotrichus Fieb.
331. diaphanus Kb.
332. flavosparsus C. Sahlb.
333. virescens D. & S.
334. concolor Kb.
335. adenocarpi Perr.
336. rubidus Put.
var. *moncreaffi* Scott.
337. ericetorum Fall.
Hypsitylus Fieb.
338. bicolor D. and S.
Pseudoloxops Kirk.
339. coccinea Mey.
Heterotoma Latr.
340. meriopterum Scop.
Heterocordylus Fieb.
341. genistae Scop.
342. leptocerus Kb.
Malacocoris Fieb.
343. chlorizans Panz.

Trib. *LABOPARIA* Reut.

Orthocephalus Fieb.
344. mutabilis Fall.
345. saltator Hhn.
Strongylocoris Blanch.
346. leucocephalus L.
347. luridus Fall.
Halticus Hhn.
348. apterus L.
349. saltator Geoffr.
350. luteicollis Panz.

Subf. **Plagiognathinae** Osh.
Trib. *PLAGIOGNATHARIA* Reut.

Onychumenus Reut.
351. decolor Fall.
Oncotylus Fieb.
352. viridiflavus Goeze.
Conostethus Fieb.
353. salinus J. Sahlb.
354. brevis Reut.
355. roseus Fall.
Hoplomachus Fieb.
356. thunbergi Fall.
Tinicephalus Fieb.
357. hortulanus Mey.
Megalocoleus Reut.
358. pilosus Schrk.
359. molliculus Fall.
Amblytylus Fieb.
360. brevicollis Fieb.
361. affinis Fieb.
362. delicatus Perr.
Macrotylus Fieb.
363. solitarius Mey.
364. paykulli Fall.

Harpocera Curt.
365. thoracica Fall.
Byrsoptera Spin.
366. rufifrons Fall.
Brachyarthrum Fieb.
367. limitatum Fieb.
Phylus Hhn.
368. palliceps Fieb.
369. melanocephalus L.
370. coryli L.

var. *avellanae* Mey.

Plesiodema Reut.
371. pinetellum Zett.
Psallus Fieb.
372. ambiguus Fall.
373. betuleti Fall.
374. obscurellus Fall.
375. variabilis Fall.

var. *simillimus* D.& S.
var. *whitei* D. & S.

376. quercus Kb.
377. lepidus Fieb.

var. *roseus* H. S.

378. alnicola D. & S.
379. falleni Reut.
379a. luridus Reut.
380. varians H. S.
381. diminutus Kb.
382. albicinctus Kb.
383. roseus F.
384. vitellinus Schltz.
385. salicellus Mey.
Atractotomus Fieb.
386. mali Mey.
387. magnicornis Fall.
Plagiognathus Fieb.
388. chrysanthemi Wolff.
389. arbustorum F.
390. albipennis Fall.
Chlamydatus Curt.
391. pullus Reut.
392. saltitans Fall.
393. wilkinsoni D. & S.
394. evanescens Boh.
Microsynamma Fieb.
395. bohemani Fall.

var. *scotti* Fieb.

Sthenarus Fieb.[1]
396. roseri H. S.
397. rottermundi Schltz.
Asciodema Reut.
398. obsoletum Fieb.
399. fieberi D. & S.

TRICHOTELOCERA Reut.

Superf. Dipsocoroideae Reut.

Fam. 19. **DIPSOCORIDAE** Dhrn.

Ceratocombus Sign.
400. coleoptratus Zett.
Pachycoleus Fieb.
401. rufescens J. Sahlb.
Dipsocoris Halid.
402. alienus H. S.

HYDROBIOTICA Reut.

Superf. Gerroideae Reut.

Phalanx *HYDROMETRIFORMES* Reut.

Fam. 20. **HYDROMETRIDAE** Billb.

Hydrometra Latr.
403. stagnorum L.

Phalanx *GERRIFORMES* Reut.

Fam. 21. **GERRIDAE** Leach.

Gerris F.

Subg. limnoporus Stål.

404. rufoscutellatus Latr.

Subg. hygrotrechus Stål.

405. paludum F.
406. najas De G.

Subg. gerris Latr.

407. costae H. S.
408. thoracicus Schum.
409. asper Fieb.
410. gibbifer Schum.
411. lacustris L.
412. odontogaster Zett.
413. argentatus Schum.

Fam. 22. **VELIIDAE** Dhrn.

Microvelia Westw.
414. pygmaea Duf.
Velia Latr.
415. currens F.

Superf. Acanthioideae Reut.

Phalanx *AËPOPHILIFORMES* Reut.

Fam. 23. **AËPOPHILIDAE** Put.

Aëpophilus Sign.
416. bonnairei Sign.

Phalanx *ACANTHIIFORMES* Reut.

Fam. 24. **ACANTHIIDAE** Leach.

Chiloxanthus Reut.
  417. pilosus Fall.
Halosalda Reut.
  418. lateralis Fall.
Salda F.
  419. littoralis L.
  420. muelleri Gmel.
  421. morio Zett.
Acanthia F.
  422. scotica Curt.
  423. orthochila Fieb.
  424. saltatoria L.
  425. c-album Fieb.
  426. setulosa Put.
  427. opacula Zett.
  428. pilosella Thms.
  429. pallipes F.
  430. arenicola Schltz.
Micracanthia Reut.
  431. marginalis Fall.
Teloleuca Reut.
  432. pellucens F.
Chartoscirta Stål.
  433. cincta H. S.
  434. elegantula Fall.
      var. *flori* Dhrn.
  435. cocksi Curt.

Superf. Notonectoideae Reut.

Phalanx *NEPAEFORMES* Reut.

Fam. 25. **NAUCORIDAE** Fall.

Trib. *APHELOCHIRARIA* Stål.

Aphelochirus Westw.
  436. montandoni Horv.

Trib. *NAUCORARIA* Stål.

Naucoris F.
  437. cimicoides L.

Fam. 26. **NEPIDAE** Leach.

Nepa L.
  438. cinerea L.
Ranatra F.
  439. linearis L.

Phalanx *NOTONECTIFORMES* Reut.

Fam. 27. **NOTONECTIDAE** Leach.

Subf. **Pleinae** Fieb.

Plea Leach.
  440. minutissima Fuessl.

Subf. **Notonectinae** Fieb.

Notonecta L.
  441. glauca L.
      var. *furcata* F.
      var. *maculata* F.

[442. halophila Edw.]

SANDALIORRHYNCHA Reut.

Superf. Corixoideae Reut.

Fam. 28. **CORIXIDAE** Leach.

Corixa Geoffr.
  443. geoffroyi Leach.
  444. affinis Leach.
  [445. panzeri Fieb.]
Arctocorisa Wall.
  446. lugubris Fieb.
  447. selecta Fieb.
  448. hieroglyphica Duf.
  449. sahlbergi Fieb.
  450. linnei Fieb.
  451. limitata Fieb.
  452. semistriata Fieb.
  453. venusta D. & S.
  454. striata L.
  455. falleni Fieb.
  456. distincta Fieb.
  457. moesta Fieb.
  458. fossarum Leach.
  459. scotti Fieb.
  460. fabricii Fieb.
  461. saundersi Kirk.
  462. carinata C. Sahlb.
  463. germari Fieb.
Callicorixa B. White.
  464. boldi D. & S.
  465. praeusta Fieb.
      var. *socia* D.& S.
      var. *wollastoni* D.& S.
  466. sodalis D. & S.
  467. caledonica Kirk.
  468. concinna Fieb.
Glaenocorisa Thms.
  469. cavifrons Thms.
Cymatia Flor.
  470. bonsdorffi C. Sahlb.
  471. coleoptrata F.
Micronecta Kirk.
  472. minutissima L.
      var. *poweri* D.& S.
  473. scholtzi Fieb.

SEASONAL DISTRIBUTION OF THE

Name of Species	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Odont. fuliginosa L.	.	.	.	.	+	+	+	+	+	.	.	.
,, dorsalis F.	.	.	.	.	.	+	+	+	.	.	.	.
Eurygaster maura L.	.	.	+	.	+	+	+	+	+	+	.	.
,, nigrocucullata	.	.	.	+	+	+	+	+	+	+	.	.
Podops inuncta F.	+	.	+	+	+	+	.	+	+	+	+	.
Th. scarabaeoides L.	.	.	.	+	+	+	+	+	+	+	.	.
Cydnus flavicornis F.	.	.	.	+	.	.	+	.	.	.	.	.
Geotomus punctulatus Cost.	.	.	.	+	.	+	+	+	+	.	.	.
Sehirus bicolor L.	.	.	.	+	+	+	+	+	+	.	+	+
,, dubius Scop.	.	.	+	+	+	+	+	+	+	+	+	.
,, biguttatus L.	.	+	+	+	+	+	+	+	.	.	.	.
,, luctuosus M. & R.	.	.	+	+	+	+	+	+	+	.	.	.
Gnath. albomarginatus Goez.	.	.	+	+	+	+	+	+	+	.	.	.
,, picipes Fall.	.	.	.	.	+	.	+	+	+	.	.	.
Sciocoris cursitans F.	.	.	+	+	+	+	+	+	+	+	.	.
Aelia acuminata L.	.	.	.	+	+	+	+	+	+	.	.	.
Neottiglossa pusilla Gmel.	.	.	.	.	+	+	+	+	+	+	.	.
Eusarcoris melanocephalus F.	.	.	.	.	+	+	+	+	+	+	.	.
,, aeneus Scop.	.	.	.	.	+	+	+	+	.	.	.	.
Peribalus vernalis Wolff.	.	.	.	+	+	+	+	+	+	.	.	.
Carpocoris fuscispina Boh.	.	.	.	+	+	+	+	+	+	.	.	.
Dolycoris baccarum L.	.	.	.	+	+	+	+	+	+	+	.	.
Palomena prasina L.	+	.	.	+	+	+	+	+	+	+	.	.
Chlorochroa juniperina L.	.	.	+	+	.	+	+	+	.	+	.	.
Piezodorus lituratus F.	+	.	+	+	+	+	+	+	+	+	+	+
Pentatoma rufipes L.	.	.	.	.	+	+	+	+	+	+	.	.
Eurydema dominulus Sc.	.	.	.	.	.	+	+	+	+	.	.	.
,, oleraceum L.	.	.	.	+	+	+	+	+	+	.	.	.
Picromerus bidens L.	.	.	+	.	+	+	+	+	+	+	.	.
Rhacog. punctatus L.	+	+	+	+	+	+	+	+	+	+	+	+
Troilus luridus F.	.	.	+	+	+	+	+	+	+	+	.	.
Jalla dumosa L.	.	.	+	+	+	+	+	+	+	+	.	.
Zicrona caerulea L.	+	+	+	+	+	+	+	+	+	+	.	+
Acanth. haemorrhoidale	.	+	+	+	+	+	+	+	+	+	+	+
,, interstinctum L.	.	.	+	+	+	+	+	+	+	+	.	.
Elasmost. griseus L.	.	.	.	.	+	+	+	+	+	+	.	.
,, ferrugatus F.	.	.	.	.	+	+	+	+	+	+	.	.
Cyphost. tristriatus F.	.	.	+	+	.	+	+	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January. 1	February. 2	March. 3	April. 4	May. 5	June. 6	July. 7	August. 8	September. 9	October. 10	November. 11	December. 12
Spathocera dalmani Sc.	.	.	+	+	+	+	+	+	+	+	.	.
Enoplops scapha F.	.	.	+	+	.	+	+	+	+	+	.	.
Syromast. marginatus L.	.	.	.	+	+	+	+	+	+	.	.	.
Verlusia quadrata F.	.	.	+	+	+	+	+	+	+	+	.	.
Gon. acuteangulatus Goez.	.	.	.	.	+	+	+	+	+	+	.	.
Pseudoph. fallenii Schill.	.	.	+	+	+	+	+	+	+	+	.	.
,, waltlii H. S.	.	.	.	.	+	+	+	+	+	.	.	.
Bathysolen nubilus Fall.	.	+	.	+	+	+	+	+	+	+	+	.
Ceraleptus lividus Stein.	.	+	+	+	+	.	+	+	+	+	.	.
Coreus denticulatus Scop.	+	.	.	+	+	+	+	+	.	+	.	.
Alydus calcaratus L.	.	.	.	.	.	+	+	+	+	.	.	.
Stenoceph. agilis Scop.	.	.	+	+	+	+	+	+	+	+	+	.
,, medius M. & R.	.	.	.	.	+	+	.	+	.	+	.	.
,, albipes F.	.	.	.	.	.	.	+	.	.	.	.	.
Therapha hyoscyami L.	+	.	+	+	+	+	+	+	+	+	.	.
Corizus crassicornis L.	.	.	.	.	+	+	+	+	+	+	.	.
,, v. abutilon Rossi	.	.	.	.	.	+	+	+	+	+	.	.
,, maculatus Fieb.	.	.	.	.	.	+	+	+	+	+	.	.
,, subrufus Gmel.	.	.	.	+	+	+	+	+	+	+	+	.
,, rufus Schill.	.	.	.	.	.	.	.	+	+	.	.	.
,, parumpunctatus	.	.	.	+	+	+	+	+	+	.	.	.
,, hyalinus F.	.	.	.	+	+	+	+	.	.	+	.	.
Myrmus miriformis Fall.	.	.	.	.	.	+	+	+	+	+	.	.
Chorosoma schillingi Schm.	.	.	+	.	+	+	+	+	+	+	+	.
Neides tipularius L.	.	.	+	+	+	+	+	+	+	+	.	.
Berytus clavipes F.	.	.	.	+	+	+	+	+	+	+	.	.
,, minor H. S.	.	+	.	+	+	+	+	+	+	+	.	.
,, signoreti Fieb.	.	.	+	+	+	+	+	+	+	+	.	.
,, montivagus Fieb.	.	.	+	+	.	+	+	+	+	+	+	.
,, crassipes H. S.	.	.	+	+	.	+	+	+	+	+	.	.
Metatropis rufescens H. S.	.	.	.	.	+	+	+	+	.	.	.	.
Metacanth. elegans Curt.	+	.	.	+	+	+	+	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Lygaeus equestris L.	.	.	.	+	.	+	+	+	+	+	.	.
Nysius lineatus Costa.	.	.	.	.	.	+	+	+	+	+	.	.
,, thymi Wolff.	.	.	+	+	+	+	+	+	+	+	+	.
,, v. maculatus D. & S.	.	.	.	.	.	+	+	+	+	+	.	+
Cymus glandicolor Hahn.	+	.	.	+	+	+	+	+	+	+	.	.
,, obliquus Horv.	.	.	.	.	+	+	.	+	+	.	.	.
,, melanocephalus F.	.	.	.	.	.	+	+	+	+	.	.	.
,, claviculus Fall.	+	.	.	+	+	+	+	+	+	+	.	.
Ischnor. resedae Pz.	.	.	.	+	+	+	+	+	+	+	+	.
,, geminatus Fieb.	.	.	.	+	+	+	+	+	+	+	.	+
Ischnod. sabuleti Fall.	.	.	+	.	.	+	+	+	+	.	.	.
Henestaris laticeps Curt.	.	.	.	.	+	.	.	+	+	.	.	.
,, halophilus Bur.	.	.	.	.	.	+	.	+	.	.	.	.
Chilacis typhae Perris.	.	+	.	.	+	.	.	+	+	.	+	.
Heterogaster artemisiae Sc.	.	.	.	.	.	+	+	+	+	.	.	.
,, urticae F.	.	.	+	+	+	+	+	+	+	+	.	.
Pamera fracticollis Sch.	.	+	.	.	+	+	+	+	+	+	.	.
,, lurida Hahn.	.	.	.	.	.	+	+	+	+	.	.	.
Rhypar. antennatus Sch.	.	.	.	+	+	+	+	+	+	+	.	.
,, praetextatus H. S.	.	.	+	+	+	+	+	+	+	.	.	.
,, dilatatus H. S.	.	.	+	+	+	.	+	+	+	.	+	.
,, chiragra F.	.	.	+	+	+	+	+	+	+	+	.	.
,, v. sabulicola Thm.	.	.	.	+	+	+	+	+	+	.	.	.
Tropist. holosericeus Schlz.	+	+	+	+	+	+	+	+	+	+	+	.
Ischnoc. angustulus Boh.	.	+	+	+	+	+	+	+	+	+	+	+
Macrod. micropterum Curt.	.	+	+	+	+	+	+	+	+	+	.	.
Pionosomus varius Wolff.	.	.	.	+	.	+	+	+	+	.	.	.
Plinth. brevipennis Latr.	.	.	+	+	+	+	+	+	+	+	.	+
Lasiosom. enervis H. S.	.	+	+	.	+	.	+	.	+	.	.	.
Acompus rufipes Wolff.	+	+	+	+	+	+	+	+	+	+	+	+
Stygnoc. rusticus Fall.	.	.	+	.	+	+	+	+	+	+	.	.
,, pedestris Fall.	+	.	.	+	.	+	+	+	+	+	+	.
,, fuligineus Geoff.	+	+	+	+	+	+	+	+	+	+	+	+
Peritr. geniculatus Hahn.	+	+	.	+	+	+	+	+	+	.	+	.
,, gracilicornis Put.	.	.	.	.	.	.	.	+	+	.	.	.
,, nubilus Fall.	.	.	.	+	.	+	+	+	+	+	.	.
,, sylvestris F.	.	+	.	+	+	+	+	+	+	+	+	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Trapez. distinguendus Fl.	.	.	+	.	+	.	+	+	.	.	.	.
,, arenarius L.	.	.	+	+	+	+	+	+	+	+	.	.
,, dispar Stål.	.	.	.	+	+	.	+	+	+	.	.	.
,, ullrichi, Fieb.	.	.	.	.	+	+	+	+	+	+	.	.
Calypt. rolandri L.	.	+	.	.	+	+	+	.	+	.	.	.
Aphanus lynceus F.	.	+	.	+	+	+	+	+	+	+	+	.
,, quadratus F.	.	.	.	+	.	+	+	+	+	+	.	.
,, alboacuminatus	.	.	.	+	+	+	+	+	.	+	+	.
,, pini L.	.	.	.	+	+	+	+	+	+	+	.	.
Beosus maritimus Scop.	.	.	.	+	+	+	+	+	+	+	.	+
Emblethis verbasci F.	.	.	+	+	.	+	+	+	+	+	.	.
Eremoc. plebeius Fall.	+	.	+	+	+	.	.	+	+	+	.	.
,, podagricus F.	.	.	.	+	+	+	+	+	+	+	.	.
,, fenestratus H. S.	.	.	.	.	+	+	+	+	+	.	.	.
Drymus pilipes Fieb.	.	.	.	.	.	.	.	+	+	+	.	.
,, latus D. & S.	.	.	.	.	.	.	.	+	.	.	.	.
,, pilicornis M. & R.	.	+	.	.	.	.	.	+	+	+	.	.
,, sylvaticus F.	+	+	+	+	+	+	+	+	+	+	+	+
,, v. ryei D. & S.	+	.	.	+	+	.	.	+	+	+	.	.
,, brunneus Sahl.	.	+	+	+	+	+	+	+	+	+	+	.
,, piceus Flor.	.	.	.	.	.	+	+	+	+	+	.	.
Notochilus limbatus Fieb.	.	.	+	+	+	.	+	.	+	.	.	.
,, contractus H. S.	+	+	+	+	+	+	+	+	+	.	.	.
,, hamulatus Th.	.	.	.	.	.	.	.	+	.	.	.	.
Scolop. pictus Schill.	.	+	.	+	+	+	+	+	+	.	.	.
,, grandis Horv.	.	.	.	+	+	+	+	+	+	.	.	.
,, affinis Schill.	+	+	+	+	+	+	+	+	+	+	.	+
,, thomsoni Reut.	.	.	+	+	+	+	+	+	+	+	.	.
,, decoratus Hahn.	+	+	+	+	+	+	+	+	+	+	.	.
,, puberulus Horv.	.	+	+	+	.	+	.	+	.	.	.	.
Gastrodes abietis L.	.	+	+	+	+	.	+	+	+	.	.	+
,, ferrugineus L.	+	+	.	+	+	+	+	+	+	+	.	.
Pyrrhocories apterus L.	.	.	.	+	+	+	+	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Piesma quadrata Fieb.	.	.	.	.	+	.	.	+	+	+	.	.
,, maculata Fieb.	.	.	+	+	+	+	+	+	+	+	+	.
Serenthia laeta Fall.	.	.	+	+	+	+	+	+	+	+	.	.
Campylostira verna Fall.	.	.	+	+	+	.	.	+	+	.	.	.
Acalypta brunnea Germ.	.	.	.	.	+	.	.	+	.	.	.	+
,, cervina Germ.	.	+	+	.	+	+	+	+	+	+	.	+
,, platychila Fieb.	.	.	.	.	+	.	+	.	+	.	.	.
,, nigrina Fall.	.	.	.	.	+	+	+	+	.	.	.	.
,, macrophthalma	.	.	.	.	.	+	+	+	.	.	.	.
,, parvula Fall.	+	+	+	+	.	+	+	+	+	+	.	.
Dictyonota tricornis Schr.	.	.	.	.	.	+	+	+	+	+	.	.
,, strichnocera Fb.	.	.	.	.	.	+	+	+	+	+	.	.
,, fuliginosa Cost.	.	.	.	.	.	+	+	+	+	.	.	.
Derephysia foliacea Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Lasiacantha capucina Ger.	.	.	.	.	.	+	.	.	.	.	.	.
Tingis ampliata Fieb.	.	+	+	+	+	+	+	+	+	+	.	+
,, cardui L.	+	.	.	.	+	+	+	+	+	+	.	.
,, angustata H. S.	.	.	.	.	+	+	.	.	+	.	.	.
Lasiotropis reticulata H. S.	.	.	.	+	+	+	.	+	+	+	.	.
Catoplatus fabricii Stal.	+	.	.	+	+	+	+	+	+	.	.	.
Physatochila 4-maculata	.	.	.	.	.	.	+	+	+	+	.	.
,, dumetorum	.	.	.	.	+	+	+	+	+	.	.	.
Oncochila simplex H. S.	.	.	.	.	+	+	+	+	.	.	.	.
Monanthia humuli F.	.	+	+	+	+	+	+	+	+	+	.	.
Aradus corticalis L.	.	.	.	+	+	+	+	.	.	.	.	.
,, depressus F.	.	.	+	+	+	+	+	+	+	+	+	+
,, betulae L.	.	.	.	.	.	.	+	.	.	.	.	.
,, aterrimus D. & S.	.	.	.	.	+	.	.	.	.	.	.	.
Aneurus laevis F.	.	.	+	+	+	+	+	+	.	+	.	.
,, avenius Duf.	.	+	.	+	.	+	.	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Hebrus pusillus Fall.	.	+	+	+	+	+	+	+	+	.	.	+
„ ruficeps Thoms.	+	+	+	+	+	+	+	+	+	+	+	+
Mesovelia furcata M. & R.	.	.	.	.	.	.	+	+	+	+	.	.
Aepophilus bonnairei Sgn.	.	+	+	+	+	+	+	+	+	+	+	+
Hydrometra stagnorum L.	.	.	+	+	+	+	+	+	+	+	.	+
Microvelia reticulata Bur.	+	.	+	+	+	+	.	+	+	.	+	+
Velia currens F.	.	+	+	+	+	+	+	+	+	.	+	.
Gerris rufoscutellatus Ltr.	.	.	+	+	+	+	+	+	+	.	.	.
„ paludum F.	.	.	.	+	+	+	+	+	+	+	.	.
„ najas De G.	.	.	+	+	+	+	+	+	+	+	.	.
„ costae H. S.	.	.	.	+	+	+	+	+	.	.	.	.
„ thoracicus Schum.	.	.	+	+	+	+	+	+	+	.	.	.
„ asper Fieb.	.	.	+	.	.	.	.	+	.	+	.	.
„ gibbifer Schum.	.	.	+	+	+	+	+	+	+	+	.	.
„ lacustris L.	.	+	+	+	+	+	+	+	+	+	.	.
„ argentatus Schum.	.	+	+	+	+	+	+	+	+	+	.	+
„ odontogaster Zett.	.	.	+	+	+	+	+	+	+	+	.	.
Ploiar. vagabunda L.	.	.	+	.	.	.	+	+	+	+	.	.
„ culiciformis De G.	+	.	+	+	+	+	+	+	+	+	.	+
„ baerensprungi Dhr.	.	.	.	.	.	+	.	+	.	.	.	.
Pygolampis bidentata Gz.	.	.	.	.	+	+	.	+	+	.	.	.
Reduvius personatus L.	.	.	.	.	+	+	+	+	+	.	.	.
Coranus subapterus De. G.	.	.	+	+	.	+	+	+	+	+	.	.
Prostemma guttula F.	.	.	.	+	.	+	.	+	+	.	.	.
Nabis apterus F.	.	.	.	.	.	+	+	+	+	+	.	.
„ lativentris Boh.	+	+	+	+	+	+	+	+	+	+	+	.
„ major Cost.	.	.	.	.	.	.	+	+	+	+	.	.
„ boops Schiödte	.	.	.	.	.	.	+	+	+	.	.	.
„ flavomarginatus Stz.	.	.	.	.	.	.	+	+	+	+	.	.
„ limbatus Dahl.	.	.	.	.	.	.	+	+	+	+	.	.
„ lineatus Dahl.	.	.	.	.	.	.	+	+	+	.	.	.
„ ferus L.	+	.	+	+	+	+	+	+	+	+	+	.
„ rugosus L.	.	+	+	+	+	+	+	+	+	+	.	.
„ ericetorum Schltz.	.	+	.	+	.	+	+	+	+	+	.	.
„ brevis Scholtz.	.	.	.	.	+	+	+	+	+	.	+	.
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Salda pilosa Fall.	.	.	.	.	+	+	+	+	.	.	.	.
„ littoralis L.	.	.	.	.	+	+	+	+	.	.	.	.
„ oculata Müll.	.	.	.	.	.	+	+	.	.	.	.	.
„ morio Zett.	.	.	.	.	.	+	+	+	+	.	.	.
„ marginalis Fall.	.	.	.	.	+	+	+	+	+	+	.	.
„ riparia Fall.	.	.	.	.	.	+	+	+	.	.	.	.
„ scotica Curt.	.	.	.	.	.	+	+	+	+	.	.	.
„ orthochila Fieb.	.	.	+	+	.	+	+	+	+	+	.	.
„ saltatoria L.	+	+	+	+	+	+	+	+	+	+	.	+
„ C-album Fieb.	+	+	+	+	+	+	+	+	+	+	+	.
„ opacula Zett.	.	.	.	.	.	.	+	.	.	.	.	.
„ setulosa Put.	.	.	.	.	.	.	.	+	.	.	.	.
„ pilosella Thoms.	.	.	.	.	.	.	+	+	+	+	.	.
„ pallipes F.	.	+	.	+	+	+	+	+	+	.	.	.
„ arenicola Schltz.	.	.	.	.	+	+	.	+	+	.	.	.
„ lateralis Fall.	.	.	.	.	+	+	+	+	+	+	.	.
„ cincta H. S.	+	+	+	+	+	+	+	+	+	+	+	+
„ cocksi Curt.	+	+	+	+	+	+	+	+	+	+	+	.
„ elegantula Fall.	.	.	+	+	+	+	+	+	+	.	.	.
„ v. flori Dohrn.	.	.	.	.	.	.	.	+	.	.	.	.
Ceratoc. coleoptratus Zett.	.	.	+	.	.	+	.	+	+	.	.	.
Pachycoleus rufescens Sahl.	.	+	+	.	.	+	+	.	.	.	.	.
Cryptost. alienum H. S.	.	.	+	+	+	+	+	+	+	+	.	.
Cimex lectularius L.	.	.	.	+	+	+	.	+	+	.	.	.
„ columbarius Jen.	.	.	.	+	.	+	.	.	+	.	.	.
„ pipistrelli Jen.	.	.	.	.	.	.	.	.	.	.	.	.
„ dissimilis Horv.	.	.	.	+	+	.	.	+	.	.	.	.
Oeciacus hirundinis Jen.	.	.	.	+	.	.	.	.	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Lyctocoris campestris F.	+	+	·	+	+	+	+	+	+	+	·	+
Piezost. galactinus Fieb.	·	·	·	·	·	+	·	+	+	·	+	·
„ cursitans Fall.	+	+	+	+	·	+	+	+	+	+	·	·
„ formicetorum Boh.	·	·	·	·	+	·	+	·	·	·	·	·
Temnost. pusillus H. S.	·	·	·	·	·	+	+	+	+	+	·	·
Elatoph. nigricornis Zett.	·	·	·	·	·	+	+	·	·	·	·	·
Anthoc. confusus Reut.	·	+	+	+	+	+	+	+	+	+	·	·
„ nemoralis F.	·	·	·	+	+	+	+	+	+	+	·	·
„ gallarum-ulmi De G.	·	·	·	+	+	+	+	+	·	·	·	+
„ sarothamni D. & S.	+	·	·	+	·	·	+	+	+	·	·	·
„ visci Doug.	·	·	·	·	·	·	·	+	+	+	·	·
„ nemorum L.	·	·	+	+	+	+	+	+	+	+	·	+
„ limbatus Fieb.	·	·	·	·	·	·	·	+	+	·	·	·
Tetraphleps vittata Fieb.	·	·	·	+	+	+	+	+	+	+	·	·
Acompoc. pygmaeus Fall.	·	·	·	+	·	+	+	+	+	+	·	·
„ alpinus Reut.	·	·	·	·	·	·	·	+	·	·	·	·
Triphleps nigra Wolff.	·	+	·	+	+	+	+	+	+	+	·	·
„ majuscula Rt.	·	+	·	·	+	+	+	+	+	+	·	·
„ minuta L.	·	·	·	·	+	·	+	+	+	+	+	·
Brachyst. parvicornis Cost.	·	·	·	·	·	+	+	+	+	+	·	·
Cardiast. fasciiventris Garb.	·	·	·	+	+	+	+	·	·	+	·	+
Xylocorid. brevipennis Rt.	·	+	+	+	·	·	·	·	+	·	·	·
Xylocoris ater Duf.	·	·	·	·	·	+	·	+	+	+	·	·
Microph. pselaphiformis Ct.	·	·	·	·	+	+	+	+	·	·	·	·
„ elegantula Baer.	·	·	·	·	·	+	+	+	+	·	·	·
Myrmed. tenella Zett.	·	·	·	·	·	+	·	+	+	·	·	·
„ distinguenda Rt.	·	·	·	·	·	+	+	+	·	·	·	·
„ inconspicua D. & S.	·	·	·	·	·	+	+	+	·	·	·	·
„ coleoptrata Fall.	·	·	·	·	·	+	+	+	·	·	·	·
Stenodema calcaratum Fl.	·	+	+	+	+	+	+	+	+	+	·	·
„ laevigatum L.	·	+	+	+	+	+	+	+	+	+	·	·
„ holsatum F.	·	·	·	+	+	+	+	+	+	+	·	+
Notostira erratica L.	·	·	+	+	+	+	+	+	+	+	·	·
Megalocer. linearis Fuessl.	·	·	·	·	·	+	+	+	+	·	·	·
Trigonotylus ruficornis Fourc.	·	·	·	·	·	+	+	+	+	+	·	·
„ psammaecolor	·	·	·	·	·	·	+	+	·	·	·	·
Acetropis gimmerthalii Flo.	·	·	·	·	·	+	+	+	+	·	·	·
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Teratocoris antennatus Bo.	.	.	.	.	.	+	+	+	+	+	.	.
,, viridis D. & S.	.	.	.	.	.	+	+	.	.	.	.	.
,, saundersi D. & S.	.	.	.	.	.	+	+	+	+	.	.	.
Leptopterna ferrugata Fall.	.	.	.	.	.	+	+	+	+	.	.	.
,, dolabrata L.	.	.	.	.	+	+	+	+	+	.	.	.
Lopus gothicus L.	.	.	.	.	+	+	+	+	.	.	.	.
,, v. superciliosus L.	.	.	.	.	.	.	+	.	.	.	.	.
,, flavomarginatus Don.	.	.	.	.	.	+	+	+	.	.	.	.
,, sulcatus Fieb.	.	.	.	.	.	+	+	+	.	.	.	.
Pantilius tunicatus F.	.	.	.	+	.	+	+	+	+	+	+	.
Mirid. 4-virgatus Costa.	.	.	.	.	.	+	+	+	.	.	.	.
Phyotcoris populi L.	.	.	.	.	.	+	+	+	+	+	+	.
,, v. distinctus D.	.	.	.	.	.	.	.	+	+	.	.	.
,, tiliae F.	.	.	.	.	.	+	+	+	+	+	.	.
,, longipennis Flo.	.	.	.	.	.	.	+	+	+	+	.	.
,, dimidiatus Kb.	.	.	.	.	.	+	+	+	+	.	.	.
,, reuteri Saund.	.	.	.	.	.	+	.	+	+	.	.	.
,, pini Kb.	.	.	.	.	.	.	.	+	.	+	.	.
,, varipes Boh.	.	.	.	.	.	.	+	+	+	+	.	.
,, ulmi L.	.	.	.	.	.	+	+	+	+	+	.	.
Megacoelum infusum H. S.	.	.	.	.	.	.	+	+	+	+	.	.
,, beckeri Fieb.	.	.	.	.	.	.	.	+	+	.	.	.
Adelphoc. lineolatus Goeze.	.	.	.	.	+	+	+	+	+	+	.	.
,, ticinensis Mey.	.	.	.	.	+	+	+	+	+	+	.	.
,, seticornis F.	.	.	.	.	.	+	+	+	+	.	.	.
Calocoris norvegicus Gmel.	.	.	.	.	+	+	+	+	+	+	.	.
,, roseomaculatus	.	.	.	+	.	+	+	+	+	+	.	.
,, alpestris Mey.	.	.	.	.	+	+	+	+	.	.	.	.
,, fulvomaculatus	.	.	.	.	.	+	+	+	.	.	+	.
,, sexguttatus F.	.	.	.	.	.	+	+	+	.	.	.	.
,, ochromelas Gmel.	.	.	.	+	+	+	+	.	.	.	.	.
Homodemus M-flavum Goz.	.	.	.	.	.	+	+	+	.	.	.	.
Pycnopterna striata L.	.	.	.	.	+	+	+	.	.	.	.	.
Stenotus binotatus F.	.	.	.	.	+	+	+	+	+	+	.	.
Dichrooscytus rufipennis Fl.	.	.	.	.	.	+	+	+	+	.	.	.
,, valesianus Fieb.	.	.	.	.	.	.	+	.	.	.	.	.
Plesiocoris rugicollis Fall.	.	.	.	.	.	+	+	+	+	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January. 1	February. 2	March. 3	April. 4	May. 5	June. 6	July. 7	August. 8	September. 9	October. 10	November. 11	December. 12
Lygus pabulinus L.	.	.	.	.	+	+	+	+	+	+	.	.
„ contaminatus Fall.	.	.	.	.	.	+	+	+	+	+	.	.
„ viridis Fall.	.	.	.	.	.	+	+	+	+	.	.	.
„ limbatus Fall.	.	.	.	.	.	+	+	+	.	.	.	.
„ lucorum Mey.	.	.	.	.	.	+	+	+	+	+	.	.
„ spinolae Mey.	.	.	.	.	.	+	+	+	+	.	.	.
„ pratensis L.	+	+	.	+	+	+	+	+	+	+	+	.
„ rubricatus Fall.	.	.	.	.	.	+	+	+	+	.	.	.
„ atomarius Mey.	.	.	.	+	.	.	.	+	+	+	.	.
„ cervinus H. S.	.	.	.	.	+	+	+	+	+	.	+	.
„ viscicola Put.	.	.	.	.	.	.	.	+	+	.	.	.
„ pastinacae Fall.	.	.	.	.	+	+	+	+	+	+	.	.
„ kalmii L.	.	.	.	.	+	+	+	+	+	+	.	.
„ rubicundus Fall.	.	.	.	.	+	+	.	+	.	+	.	.
Camptozyg. pinastri Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Poecilosc. unifasciatus F.	.	.	.	.	.	+	+	+	+	.	.	.
„ palustris Reut.	.	.	.	.	.	.	+	+	+	.	.	.
„ vulneratus Pz.	.	.	.	.	.	+	+	+	+	+	.	.
Polymerus nigritus Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Charago. gyllenhalii Fall.	.	.	.	+	+	+	+	+	+	+	.	
Liocoris tripustulatus F.	.	+	.	+	+	+	+	+	+	+	.	.
Camptobr. lutescens Schill.	.	+	+	+	+	+	+	+	+	+	.	+
Capsus ruber L.	.	.	.	.	.	+	+	+	+	.	.	.
„ scutellaris F.	.	.	.	.	.	+	+	.	.	.	.	.
Rhopalotomus ater L.	.	.	.	.	+	+	+	+	+	.	.	.
Pithanus maerkeli H. S.	.	.	.	.	.	+	+	+	+	.	.	.
Myrmecoris gracilis Sahlb.	.	.	.	.	.	+	+	+	.	.	.	.
Bothynotus pilosus Boh.	.	.	.	.	.	.	+	+	+	+	.	.
Monalocoris filicis L.	.	.	.	.	+	+	+	+	+	+	.	.
Bryocoris pteridis Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Allodapus rufescens Bur.	.	.	.	.	.	.	+	+	+	.	.	.
Systell. triguttatus L.	.	.	.	.	.	+	+	+	.	.	.	.
Macrolophus nubilus H. S.	.	.	.	.	.	+	+	+	.	.	.	.
Dicyphus constrictus Boh.	.	.	.	.	.	.	+	+	+	.	.	.
„ epilobii Reut.	.	.	.	.	.	.	+	+	+	+	+	+
„ errans Wolff.	.	.	.	.	.	+	+	+	+	.	+	.
„ stachydis Reut.	.	.	.	.	+	+	+	+	+	+	.	.
„ pallidicornis Fieb.	.	.	.	.	+	+	+	+	+	+	.	.
„ globulifer Fall.	.	.	.	.	+	+	+	+	+	+	.	.
„ annulatus Wolff.	.	.	.	.	.	+	+	+	+	+	+	.
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January. 1	February. 2	March. 3	April. 4	May. 5	June. 6	July. 7	August. 8	September. 9	October. 10	November. 11	December. 12
Campylon. virgula H. S.	.	.	.	.	.	.	+	+	+	+	.	.
Orthoceph. saltator Hahn.	.	.	.	.	.	+	+	+	+	.	.	.
,, mutabilis Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Strongyl. leucocephalus L.	.	.	.	.	+	+	+	+	.	.	.	.
,, luridus Fall.	.	.	.	.	.	+	+	+	.	.	.	.
Halticus luteicollis Pz.	.	.	.	.	.	+	+	+	.	.	.	.
,, saltator Geoff.	.	.	.	.	.	.	.	.	+	.	.	.
,, apterus L.	.	.	.	.	.	+	+	+	.	.	.	.
Piloph. cinnamopterus Kb.	.	.	.	.	.	+	+	+	+	.	.	.
,, clavatus L.	.	.	.	.	.	+	+	+	+	.	.	.
,, perplexus D. & S.	.	.	.	.	.	.	+	+	+	+	.	.
Cyllocoris histrionicus L.	.	.	.	.	+	+	+	+	+	.	.	.
,, flavonotatus Boh.	.	.	.	.	+	+	+	.	.	.	.	.
Aetorhinus angulatus Fal.	.	.	.	.	.	+	+	+	+	+	.	.
Globiceps cruciatus Reut.	.	.	.	.	.	.	+	+	+	.	.	.
,, flavomaculatus F.	.	.	.	.	+	+	+	+	.	.	.	.
,, dispar Boh.	.	.	.	.	.	+	+	+	.	.	.	.
Mecomma ambulans Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Cyrtor. caricis Fall.	.	.	.	.	+	+	+	+	+	.	.	.
,, pygmaeus Zett.	.	.	.	.	.	.	.	+	+	.	.	.
,, geminus Flor.	.	.	.	.	.	.	.	.	+	+	.	.
,, flaveolus Reut.	.	.	.	.	.	.	+	+	+	.	.	.
Orthotylus fuscescens Kb.	.	.	.	.	.	+	+	+	.	.	.	.
,, bilineatus Fall.	.	.	.	.	.	.	+	+	+	.	.	.
,, virens Fall.	.	.	.	.	.	.	+	.	.	.	.	.
,, flavinervis Kb.	.	.	.	.	.	.	+	+	.	.	.	.
,, marginalis Rt.	.	.	.	.	.	+	+	+	+	+	.	.
,, tenellus Fall.	.	.	.	.	.	+	+	+	.	.	.	.
,, nassatus F.	.	.	.	.	.	.	+	+	+	.	.	.
,, viridinervis Kb.	.	.	.	.	.	.	+	+	.	.	.	.
,, prasinus Fall.	.	.	.	.	.	+	+	+	.	.	.	.
,, scotti Reut.	.	.	.	.	.	+	.	+	+	.	.	.
,, ochrotrichus Fieb.	.	.	.	.	.	.	+	+	+	.	.	.
,, diaphanus Kb.	.	.	.	.	.	.	+	+	+	.	.	.
,, flavosparsus Shlb.	.	.	.	.	.	+	+	+	+	.	.	.
,, chloropterus Kb.	.	.	.	.	.	.	+	+	+	.	.	.
,, concolor Kb.	.	.	.	.	.	.	.	+	.	.	.	.
,, adenocarpi Perr.	.	.	.	.	.	.	+	+	.	.	.	.
,, rubidus Put.	.	.	.	.	.	+	+	+	+	+	.	.
,, v. moncreaffi D. & S.	.	.	.	.	.	+	+	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Orthotylus ericetorum Fab.	.	.	.	.	.	.	+	+	+	+	.	.
Hypsitylus bicolor D. & S.	.	.	.	.	.	.	+	+	+	.	.	.
Loxops coccinea Mey.	.	.	.	.	.	.	.	+	+	.	.	.
Heterotoma meriopterum Sc.	.	.	.	.	.	.	+	+	+	+	.	.
Heterocord. genistae Scop.	.	.	.	.	.	+	+	+	.	.	.	.
,, tibialis Hahn.	.	.	.	.	+	+	+	+	.	.	.	.
Malacocoris chlorizans Fl.	.	.	.	.	.	+	+	+	+	+	.	.
Onychum. decolor Fall.	.	.	.	.	.	+	+	+	.	.	.	.
Oncot. viridiflavus Goeze.	.	.	.	.	.	.	+	+	+	.	.	.
Conostethus salinus Sahl.	.	.	.	.	.	+	+	.	.	.	.	.
,, brevis Reut.	.	.	.	.	.	.	+	.	.	.	.	.
,, roseus Fall.	.	.	.	.	+	+	+	.	.	.	.	.
Hoplomach. thunbergi Fall.	.	.	.	.	+	+	+	+	.	.	.	.
Megalocol. pilosus Schr.	.	.	.	.	.	.	+	+	+	.	.	.
,, molliculus Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Tiniceph. hortulanus Mey.	.	.	.	.	.	+	+	+	.	.	.	.
Amblytylus delicatus Perr.	.	.	.	.	.	.	.	.	.	.	.	.
,, brevicollis Fieb.	.	.	.	.	.	.	+	.	.	.	.	.
,, affinis Fieb.	.	.	.	.	.	+	+	+	.	.	.	.
Macrotyl. solitarius Mey.	.	.	.	.	.	.	+	+	.	.	.	.
,, paykulli Fall.	.	.	.	.	.	+	+	+	+	.	.	.
Harpocera thoracica Fall.	.	.	.	+	+	+	+	+	+	+	.	.
Byrsoptera rufifrons Fall.	.	.	.	.	.	+	+	+	+	+	.	.
Brachyarth. limitatum Fieb.	.	.	.	.	.	.	+	.	.	.	.	.
Phylus palliceps Fieb.	.	.	.	.	+	+	+	+	.	.	.	.
,, melanocephalus L.	.	.	.	.	+	+	+	+	.	.	.	.
,, coryli L.	.	.	.	.	+	+	+	+	+	.	.	.
,, v. avellanae Mey.	.	.	.	.	.	+	+	+	+	.	.	.
Plesiodema pinetellum Zet.	.	.	.	.	+	+	+	+	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

SEASONAL DISTRIBUTION OF THE

Name of Species.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1	2	3	4	5	6	7	8	9	10	11	12
Psallus ambiguus Fall.	.	.	.	.	.	+	+	+	+	+	.	.
,, betuleti Fall.	.	.	.	.	+	+	+	+	.	.	.	.
,, obscurellus Fall.	.	.	.	.	.	+	+	+	.	.	.	.
,, variabilis Fall.	.	.	.	.	.	+	+	+	.	+	.	.
,, v. whitei D. & S.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. simillimus D. & S.	.	.	.	.	.	+	+	+	+	+	.	.
,, quercus Kb.	.	.	.	.	.	+	+	+	.	.	.	.
,, lepidus Fieb.	.	.	.	.	.	+	+	+	.	.	.	.
,, v. minor	.	.	.	.	.	+	+	+	.	.	.	.
,, alnicola D. & S.	.	.	.	.	.	+	+	+	+	.	.	.
,, fallenii Reut.	.	.	.	.	.	+	+	+	+	.	.	.
,, luridus Reut.	.	.	.	.	.	.	+	+	+	.	.	.
,, varians H. S.	.	.	.	.	.	+	+	+	+	.	.	.
,, diminutus Kb.	.	.	.	.	.	+	+	+	.	.	.	.
,, albicinctus Kb.	.	.	.	.	.	.	+	.	.	.	.	.
,, roseus F.	.	.	.	.	.	+	+	+	+	.	.	.
,, vitellinus Scholtz.	.	.	.	.	.	+	+	+	.	.	.	.
,, salicellus Mey.	.	.	.	.	.	.	+	+	+	+	.	.
Atractot. mali Mey.	.	.	.	.	.	+	+	+	.	.	.	.
,, magnicornis Fal.	.	.	.	.	.	+	+	+	+	.	.	.
Plagiog. albipennis Fall.	.	.	.	.	.	.	+	+	+	.	.	.
,, chrysanthemi Wf.	.	.	.	.	.	+	+	+	+	+	.	.
,, arbustorum F.	.	.	.	.	.	+	+	+	+	+	.	.
Chlamyd. pullus Reut.	.	.	.	.	.	+	+	+	+	.	.	.
,, saltitans Fall.	.	.	.	.	.	+	+	+	+	.	.	.
,, wilkinsoni D. & S.	.	.	.	.	+	+	+	+	.	.	.	.
,, evanescens Boh.	.	.	.	.	+	+	.	+	.	.	.	.
Neocoris bohemani Fall.	.	.	.	.	.	.	+	+	.	.	.	.
,, v. scotti Fieb.	.	.	.	.	.	+	+	+	.	.	.	.
Sthenarus roseri H. S.	.	.	.	.	.	.	+	+	.	.	.	.
,, rottermundi Slz.	.	.	.	.	.	+	+	+	+	.	.	.
Asciodema obsoletum Fie.	.	.	.	.	.	.	+	+	+	.	.	.
,, fieberi D. & S.	.	.	.	.	.	+	+	+	+	.	.	.
Nepa cinerea L.	.	.	+	+	+	+	+	+	+	+	.	.
Ranatra linearis L.	+	+	+	+	+	+	+	.	+	+	.	.
Apheloch. montandoni Horv.	.	.	.	.	+	+	+	+	+	+	+	.
Naucoris cimicoides L.	.	.	+	+	+	+	+	+	+	+	+	+
	1	2	3	4	5	6	7	8	9	10	11	12

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	January. 1	February. 2	March. 3	April. 4	May. 5	June. 6	July. 7	August. 8	September. 9	October. 10	November. 11	December. 12
Notonecta glauca L.	+	+	+	+	+	+	+	+	+	+	+	+
,, furcata F.	.	.	.	+	+	.	.	+	+	.	+	+
,, maculata F.	+	+	.	+	+	.	+	+	+	+	.	.
,, halophila Ed.	.	.	.	+	.	.	.	+	.	.	.	.
Plea minutissima F.	.	.	+	+	+	+	.	+	+	.	+	+
Corixa geoffroyi Leach.	+	+	+	+	+	+	+	+	+	+	.	+
,, panzeri Fieb.	.	.	+	+	+	.	.	.	.	+	.	.
,, affinis Leach.	+	.	+	+	+	.	+	+	+	.	.	.
,, lugubris Fieb.	.	.	+	+	+	+	+	+	+	.	.	.
,, selecta Fieb.	.	.	+	+	.	.	.	+	.	.	.	.
,, hieroglyphica Duf.	+	.	+	+	+	+	+	+	+	+	.	.
,, sahlbergi Fieb.	+	.	+	+	+	+	+	+	+	.	+	+
,, linnaei Fieb.	+	.	+	+	+	+	+	+	+	+	+	+
,, limitata Fieb.	.	.	+	+	+	.	+	+	.	+	+	.
,, semistriata Fieb.	+	.	.	+	+	+	+	+	+	+	.	.
,, venusta D. & S.	.	.	+	+	+	+	+	+	+	.	.	+
,, striata L.	+	+	+	+	+	+	+	+	+	+	+	+
,, distincta Fieb.	.	.	+	+	+	+	+	+	+	+	.	+
,, fallenii Fieb.	+	+	+	+	+	+	+	+	+	+	.	+
,, moesta Fieb.	+	+	+	+	+	+	+	+	+	.	+	+
,, fossarum Leach.	+	+	+	+	+	+	+	+	+	+	+	+
,, saundersi Kirk.	.	.	.	.	.	+	.	.	.	.	.	.
,, scotti Scott.	+	.	+	+	+	+	.	+	+	.	.	.
,, nigrolineata Fieb.	+	.	+	+	+	+	+	+	+	+	.	.
,, boldi D. & S.	.	.	.	.	.	.	.	+	.	.	.	.
,, praeusta Fieb.	.	+	+	+	+	+	+	+	+	.	.	.
,, v. wollastoni D. & S.	.	.	.	.	+	+	+	+	.	.	.	.
,, sodalis D. & S.	.	.	.	.	.	.	.	.	+	.	.	.
,, caledonica Kirk.	.	.	.	.	.	.	.	+	+	.	.	.
,, concinna Fieb.	.	.	+	+	+	.	.	.	.	+	.	.
,, carinata Sahlb.	.	.	.	+	+	.	+	+	+	.	.	.
,, germari Fieb.	.	.	.	+	.	.	.	.	+	.	.	.
,, cavifrons Thoms.	+	+	.	.	.	.	+	.	+	.	.	.
,, bonsdorffi Sahl.	+	+	.	.	+	+	.	+	+	+	.	+
,, coleoptrata F.	+	+	+	+	+	+	+	+	+	+	+	+
Micron. minutissima L.	.	.	.	.	+	+	+	+	.	+	.	.
,, v. poweri D. &. S.	.	.	.	.	.	.	.	.	.	.	.	.
,, meridionalis Cost.	.	.	.	.	.	+	.	+	+	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12

DISTRIBUTION OF THE

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Odont. fuliginosa L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, dorsalis F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Eurygaster maura L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.
,, nigrocucullata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Podops inuncta F.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+
Th. scarabaeoides L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	+	.
Cydnus flavicornis F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geotomus punctulatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sehirus bicolor L.	+	.	+	.	.	.	.	.	.	.	+	+	.	.	+	+	+	.	.	.	+	+	.	.	+	+	+
,, dubius Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, biguttatus L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.
,, luctuosus M. & R.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	.
Gnath. albomarginatus Göz.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.
,, picipes Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
Sciocoris cursitans F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aelia acuminata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
Neottiglossa pusilla Gm.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	+	+	+
Eusarcoris melanocephalus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, aeneus Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Peribalus vernalis Wolff.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Carpocoris fuscispina Boh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dolycoris baccarum L.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	+	.	.	+	.	.
Palomena prasina L.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	+	.
Chlorochroa juniperina L.	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Piezodorus lituratus F.	+	+	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.	.	.	.	+	.	.	.	+	+	+
Pentatoma rufipes L.	+	+	+	+	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
Eurydema dominulus Sc.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, oleraceum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.
Picromerus bidens L.	+	+	.	.	+	.	+	.	.	.	+	.	.	.	+	+	+	.	.	.	+	.	.	.	.	+	.
Rhacog. punctatus L.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+
Troilus luridus F.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.
Jalla dumosa L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Zicrona caerulea L.	+	+	+	+	+	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	+	+	+
Acanth. haemorrhoidale L.	.	.	.	.	+	+	+	.	+	.	+	.	.	+	+	+	.	.	.	.	+	.	+	.	+	+	+
,, interstinctum L.	+	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	.	.	.	.	+	.	.	.	+	.	.
Elasmost. griseus L.	.	+	.	.	+	+	.	.	.	.	+	+	.	+	+	+	.	.	.	.	+	.	.	.	+	+	+
,, ferrugatus F.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cyphost. tristriatus F.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford.	Middlesex.	Essex.	Kent.	Surrey.	Sussex.	Berkshire.	Hampshire & I.W.	Wiltshire.	Dorset.	Somerset.	Devon.	Cornwall.	Flint.	Denbigh.	Carnarvon.	Anglesey.	Merioneth.	Montgomery.	Cardigan.	Radnor.	Brecknock.	Glamorgan.	Carmarthen.	Pembroke.	Scotland.	Ireland.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Odont. fuliginosa L.	·	·	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, dorsalis F.	·	·	·	·	+	+	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Eurygaster maura L.	·	+	+	+	+	+	·	+	·	+	·	+	+	·	·	·	·	·	·	·	·	·	+	·	·	·	+
,, nigrocucullata	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Podops inuncta F.	·	+	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	·	·
Th. scarabaeoides L.	·	·	+	+	+	·	+	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	+	+	·	·	·
Cydnus flavicornis F.	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Geotomus punctulatus	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	+	·	·	·	·
Sehirus bicolor L.	+	·	+	+	+	·	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	·	·
,, dubius Scop.	·	·	·	·	+	+	+	+	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, biguttatus L.	·	·	+	+	+	+	+	+	·	+	·	+	+	·	·	+	·	·	·	·	·	·	·	·	·	+	·
,, luctuosus M. & R.	·	·	·	+	+	·	+	+	·	+	·	+	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·
Gnath. albomarginatus Göz.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, picipes Fall.	·	·	·	+	+	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Sciocoris cursitans F.	·	·	·	+	+	·	·	·	·	·	+	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Aelia acuminata L.	·	·	+	+	+	+	+	+	·	+	+	+	·	·	·	+	·	·	·	·	·	·	+	·	·	·	·
Neottiglossa pusilla Gm.	+	·	+	+	+	+	+	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Eusarcoris melanocephalus	·	·	·	+	+	·	+	+	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, aeneus Scop.	·	·	·	+	·	+	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Peribalus vernalis Wolff.	·	·	·	+	·	+	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Carpocoris fuscispina Boh.	·	·	+	·	·	·	·	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Dolycoris baccarum L.	·	·	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	+	·	·	·	·	+	+	+	+	+
Palomena prasina L.	·	+	+	+	+	+	+	+	·	+	+	+	+	·	·	+	·	+	·	·	·	·	+	·	·	·	+
Chlorochroa juniperina L.	·	·	·	+	+	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Piezodorus lituratus F.	+	·	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	·	·	+	+	·	+	+
Pentatoma rufipes L.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	·	+	+	·	·	+	+
Eurydema dominulus Sc.	·	·	·	+	+	+	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·
,, oleraceum L.	·	·	+	+	+	+	+	+	·	·	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Picromerus bidens L.	·	·	+	+	+	+	+	+	·	+	·	+	+	·	·	+	·	·	·	·	·	·	+	·	·	+	+
Rhacog. punctatus L.	·	·	+	+	+	+	+	+	·	+	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	+	·
Troilus luridus F.	·	·	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	+	·	·	·	·	·	·	+	·	+
Jalla dumosa L.	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Zicrona caerulea L.	+	·	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	+	+	·	+	·
Acanth. haemorrhoidale L.	+	·	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	·	·	+	·	+	·	+
,, interstinctum L.	+	·	+	+	+	+	+	+	+	+	·	·	·	·	·	+	·	+	·	·	·	·	·	·	·	+	+
Elasmost. griseus L.	+	·	+	+	+	+	+	+	+	+	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	+	+
,, ferrugatus F.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·
Cyphost. tristriatus F.	·	·	·	+	+	+	+	·	+	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Spathocera dalmani Sc.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Enoplops scapha F.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Syromast. marginatus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.
Verlusia quadrata F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+
Gon. acuteangulatus Göz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pseudoph. fallenii Schil.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, waltlii H. S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Bathysolen nubilus Fal.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Ceraleptus lividus Stein.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Coreus denticulatus Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	+	+	.	.	+	+	+
Alydus calcaratus L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Stenoceph. agilis Scop.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	?+	.	.	?+	.	.
,, medius M. & R.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.
,, albipes F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Therapha hyoscyami L.	.	.	.	.	?+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Corizus crassicornis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. abutilon Ross.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, maculatus Fieb.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
,, subrufus Gmel.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.
,, rufus Schill.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, parumpunctatus	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+
,, hyalinus F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Myrmus miriformis Fal.	.	+	.	.	+	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	+	+
Chorosoma schillingi Sch.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Neides tipularius L.	.	+	.	.	.	+	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+
Berytus clavipes F.	.	.	.	.	?+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
,, minor H. S.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	+	+	+	.	.	.	+	+	.	.	+	+	+
,, signoreti Fieb.	+	+	.	.	+	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	+	+	.
,, montivagus Fie.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
,, crassipes H. S.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+
Metatropis rufescens H. S.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Metacanth. elegans Curt.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Spathocera dalmani Sc.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Enoplops scapha F.	.	.	.	+	.	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	.	.
Syromast. marginatus L.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	+	.	+	.	.	.	.	+	.	+	.	+
Verlusia quadrata F.	.	.	+	+	+	.	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gon. acuteangulatus Göz.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pseudoph. fallenii Schil.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.
,, waltlii H. S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bathysolen nubilus Fal.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ceraleptus lividus Stein.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Coreus denticulatus Scop.	.	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Alydus calcaratus L.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	+	.	.	.	.	+	.	.	.	.
Stenoceph. agilis Scop.	.	.	+	+	+	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	+	?+	.
,, medius M. & R.	.	.	.	+	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, albipes F.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Therapha hyoscyami L.	.	.	.	.	.	+	.	+	.	+	.	+	+	.	.	+	.	+	.	.	.	.	+	+	+	.	.
Corizus crassicornis L.	.	.	.	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. abutilon Ross.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, maculatus Fieb.	.	.	.	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, subrufus Gmel.	.	.	.	+	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, rufus Schill.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, parumpunctatus	.	.	.	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
,, hyalinus F.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Myrmus miriformis Fal.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chorosoma schillingi Sch.	.	.	+	+	.	+	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Neides tipularius L.	.	.	+	+	+	.	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Berytus clavipes F.	+	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, minor H.S.	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, signoreti Fieb.	+	.	.	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, montivagus Fie.	.	+	.	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, crassipes H.S.	.	.	.	+	+	+	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Metatropis rufescens H.S.	.	.	.	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Metacanth elegans Curt.	+	.	+	+	+	+	.	+	.	+	+	+	+	.	.	+	.	+	.	.	.	.	+	+	+	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Lygaeus equestris L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Nysius lineatus Costa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, thymi Wolff.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	.	.	.	+	.	.	.	.	+	.	+
,, v. maculatus D.& S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cymus glandicolor Hahn.	.	+	.	.	+	.	+	.	.	.	+	.	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.
,, obliquus Horv.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, melanocephalus F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.
,, claviculus Fall.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	+	+	.	.	+
Ischnor. resedae Pz.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	+	.	+
,, geminatus Fieb.	+	+	+	.	+	+	+	.	.	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	+
Ischnod. sabuleti Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Henestaris laticeps Curt.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, halophilus Bur.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chilacis typhae Perris	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	+	.	.
Heterogaster artemisiae Sc.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, urticae F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.
Pamera fracticollis Sch.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, lurida Hahn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhypar. antennatus Sch.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, praetextatus H. S.	.	.	.	.	?+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, dilatatus H.S . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	+
,, chiragra F.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.	+
,, v. sabulicola Thm.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Tropist. holosericeus Scholz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Ischnoc. angustulus Boh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+
Macrod. micropterum Cur.	.	+	.	.	+	.	+	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Pionosomus varius Wolff.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plinth. brevipennis Latr.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	+
Lasiosom. enervis H. S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Acompus rufipes Wolff.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	+
Stygnoc. rusticus Fall.	+	+	.	.	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	.	+	+	.	+	+	.
,, pedestris Fall.	+	+	+	+	+	+	+	.	.	.	+	.	.	+	+	+	.	.	.	.	.	+	+	.	+	+	+
,, fuligineus Geoff.	+	+	+	.	+	+	+	.	.	.	+	.	.	+	+	+	+	+	+	.	.	.	.	.	+	+	+
Peritr. geniculatus Hahn.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
,, gracilicornis Put.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, nubilus Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, sylvestris F.	+	+	.	.	.	+	.	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	.	.	+	+	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford.	Middlesex.	Essex.	Kent.	Surrey.	Sussex.	Berkshire.	Hampshire & I.W.	Wiltshire.	Dorset.	Somerset.	Devon.	Cornwall.	Flint.	Denbigh.	Carnarvon.	Anglesey.	Merioneth.	Montgomery.	Cardigan.	Radnor.	Brecknock.	Glamorgan.	Carmarthen.	Pembroke.	Scotland.	Ireland.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Lygaeus equestris L.	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Nysius lineatus Costa	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, thymi Wolff.	.	.	+	+	+	+	+	.	.	+	.	+	+	.	.	+	.	+	.	.	.	.	+	+	.	+	+
,, v. maculatus D.& S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cymus glandicolor Hahn.	+	.	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	.	+
,, obliquus Horv.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, melanocephalus F.	.	.	.	.	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, claviculus Fall.	.	.	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	+
Ischnor. resedae Pz.	.	.	+	+	+	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, geminatus Fieb.	.	.	.	+	+	+	+	+	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.
Ischnod. sabuleti Fall.	+	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Henestaris laticeps Curt.	.	.	+	+	.	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, halophilus Bur.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chilacis typhae Perris	.	.	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Heterogaster artemisiae Sc.	.	.	.	.	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, urticae F.	+	+	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	+
Pamera fracticollis Sch.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, lurida Hahn.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhypar. antennatus Sch.	.	.	.	+	+	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, praetextatus H. S.	.	.	+	+	+	+	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
,, dilatatus H.S.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, chiragra F.	.	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.
,, v. sabulicola Thm.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tropist. holosericeus Scholz.	.	.	.	.	+	.	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ischnoc. angustulus Boh.	.	.	.	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Macrod. micropterum Cur.	.	.	.	+	+	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Pionosomus varius Wolff.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plinth. brevipennis Latr.	.	.	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Lasiosom. enervis H. S.	.	.	.	+	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acompus rufipes Wolff.	.	.	+	+	+	.	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stygnoc. rusticus Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	+	.	.	.	.	+	+	.	.	+
,, pedestris Fall.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
,, fuligineus Geoff.	+	.	+	+	+	+	+	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Peritr. geniculatus Hahn.	+	.	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, gracilicornis Put.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, nubilus Fall.	.	.	+	+	.	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, sylvestris F.	.	+	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	+	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Trapez. distinguendus Fl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, arenarius L.	+	+	.	.	+	+	+	.	.	+	+	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.	.
,, dispar Stål.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, ullrichi Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calypt. rolandri L.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aphanus lynceus F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+
,, quadratus F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, alboacuminatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, pini L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	+	.	.
Beosus maritimus Sco.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Emblethis verbasci F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eremoc. plebeius Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, podagricus F.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, fenestratus H.S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Drymus pilipes Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, latus D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.
,, pilicornis M. & R.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+
,, sylvaticus F.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	+	.	+	+	+	.	+	+	+
,, v. ryei D. & S.	.	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.
,, brunneus Sahl.	+	+	+	.	+	+	+	.	.	+	+	+	.	.	+	+	.	.	.	.	+	.	.	.	+	+	+
,, piceus Flor.	+	+	+	.	+	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+
Notochilus limbatus Fie.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
,, contractus H. S.	+	.	+	.	.	+	+	.	.	.	+	.	.	.	+	+	+	.	.	.	+	.	+	.	+	+	+
,, hamulatus Th.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Scolop. pictus Schill.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	+	.
,, grandis Horv.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, affinis Schill.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	+	.	+	.	+	.	+	.	+
,, thomsoni Reut.	.	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	.	.	.	+	+
,, decoratus Hahn.	.	+	+	.	+	.	+	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	+	.	.	+	+
,, puberulus Horv.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.
Gastrodes abietis L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	+	+	.
,, ferrugineus L.	.	+	.	.	+	.	+	.	.	.	.	+	.	+	+	+	.	.	.	.	.	.	+	.	+	+	+
Pyrrhocoris apterus L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

RITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Trapez. distinguendus Fl.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, arenarius L.	.	.	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, dispar Stål.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, ullrichi Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calypt. rolandri L.	.	.	.	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aphanus lynceus F.	.	.	+	+	+	+	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, quadratus F.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
,, alboacuminatus	.	.	+	+	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, pini L.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Beosus maritimus Sco.	.	.	+	+	.	.	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	.	.
Emblethis verbasci F.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eremoc. plebeius Fall.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, podagricus F.	+	.	.	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, fenestratus H.S.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Drymus pilipes Fieb.	.	.	.	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, latus D. & S.	.	.	.	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, pilicornis M. & R.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, sylvaticus F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, v. ryei D. & S.	+	+	.	+	+	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, brunneus Sahl.	.	+	+	+	+	+	+	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, piceus Flor.	.	.	+	+	+	.	.	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+	.
Notochilus limbatus Fie.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, contractus H. S.	+	.	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	.
,, hamulatus Th.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scolop. pictus Schill.	+	.	.	.	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, grandis Horv.	.	.	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, affinis Schill.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	+	+	.	+	+
,, thomsoni Reut.	+	.	.	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, decoratus Hahn.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, puberulus Horv.	.	.	.	.	.	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Gastrodes abietis L.	+	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, ferrugineus L.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Pyrrhocoris apterus L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	+	.	.	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26
Piesma quadrata Fie.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
„ maculata Fie.	.	.	.	.	+	.	.	+	.	.	+	.	.	+	+	+	+	.	.	.	+	.	.	.	+	+
Serenthia laeta Fal.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	+	.	.	.
Campylostira verna Fal.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Acalypta brunnea Ger.	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
„ cervina Ger.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	+	.
„ platychila Fie.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
„ nigrina Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
„ macrophthalma	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ parvula Fall.	+	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	.	.	.	.	+	.	+	.	+	.
Dictyonota tricornis Sch.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	+	.
„ strichnocera Fb.	.	+	.	.	+	.	.	.	.	.	+	+	.	.	+	+	.	.	.	.	+	.	+	+	+	+
„ fuliginosa Cost.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Derephysia foliacea Fall.	+	+	+	.	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	+
Lasiacantha capucina Ger.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tingis ampliata Fieb.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	+	+	+	.	.	+	.	.	+	.	+	+
„ cardui L.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	+	.	.	+	+	+	.	+	+
„ angustata H. S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lasiotropis reticulata H. S.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	+	+
Catoplatus fabricii Stål.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	+
Physatochila 4-maculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ dumetorum	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	+
Oncochila simplex H. S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Monanthia humuli F.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	+	.	+	.	+	+
Aradus corticalis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ depressus F.	.	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	.	.	.	.	+	+	.	+	+	+
„ betulae L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ aterrimus D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aneurus laevis F.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.
„ avenius Duf.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

RITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford.	Middlesex.	Essex.	Kent.	Surrey.	Sussex.	Berkshire.	Hampshire & I.W.	Wiltshire.	Dorset.	Somerset.	Devon.	Cornwall.	Flint.	Denbigh.	Carnarvon.	Anglesey.	Merioneth.	Montgomery.	Cardigan.	Radnor.	Brecknock.	Glamorgan.	Carmarthen.	Pembroke.	Scotland.	Ireland.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Piesma quadrata Fie.	.	.	+	+	.	+	.	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	.	+	+	+
,, maculata Fie.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.
Serenthia laeta Fal.	+	.	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Campylostira verna Fal.	+	.	.	+	+	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acalypta brunnea Ger.	.	.	.	+	+	+	.	+	.	+	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	+	+
,, cervina Ger.	.	.	.	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, platychila Fie.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, nigrina Fall.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, macrophthalma	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, parvula Fall.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
Dictyonota tricornis Sch.	+	.	+	+	+	+	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	+
,, strichnocera Fb.	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	.
,, fuliginosa Cost.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Derephysia foliacea Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Lasiacantha capucina Ger.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tingis ampliata Fieb.	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, cardui L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	+	+	+	.	+	+
,, angustata H. S.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lasiotropis reticulata H. S.	.	.	+	+	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Catoplatus fabricii Stål.	+	.	.	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Physatochila 4-maculata	.	.	.	.	+	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, dumetorum	+	.	.	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Oncochila simplex H. S.	.	.	.	+	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Monanthia humuli F.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.
Aradus corticalis L.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, depressus F.	+	.	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, betulae L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, aterrimus D. & S.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aneurus laevis F.	.	+	+	+	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, avenius Duf.	.	.	.	+	+	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26
Hebrus pusillus Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	+	.
„ ruficeps Thoms.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	+
Mesovelia furcata M. & R.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aëpophilus bonnairei Sign.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hydrometra stagnorum L.	+	+	+	.	+	+	+	.	+	+	+	+	+	+	+	+	+	.	.	+	+	+	+	.	+	+
Microvelia reticulata Bur.	+	+	.	.	+	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	+	+	.	.	+	+
Velia currens F.	+	+	+	.	+	+	+	.	+	+	+	+	+	+	+	+	+	.	.	.	+	+	+	.	+	+
Gerris rufoscutellatus Ltr.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
„ paludum F.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ najas De G.	+	+	+	+	+	.	+	.	.	.	.	+	.	+	.	+	+	.	.	.	+	.	.	.	.	.
„ costae H. S.	+	+	+	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ thoracicus Schum.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	.	+	.	+
„ asper Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
„ gibbifer Schum.	.	+	+	.	+	+	+	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+
„ lacustris L.	+	+	+	+	+	+	+	.	.	.	+	+	+	+	+	+	+	.	.	.	+	+	+	.	+	+
„ argentatus Schum.	.	.	+	.	+	.	+	.	.	.	.	.	.	+	+	+	+	+	.	.	+	.	.	.	.	+
„ odontogaster Zett.	+	+	+	.	+	+	+	.	.	.	+	.	.	+	+	.	+	.	.	.	+	.	+	.	.	+
Ploiar. vagabunda L.	.	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	+	+	.	.	.	+	+
„ culiciformis De G.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
„ baerensprungi Dhr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Pygolampis bidentata Göz.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Reduvius personatus L.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	+	+	+	.	.	.	+	.	.	.	+	+
Coranus subapterus De G.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Prostemma guttula F.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Nabis apterus F.	.	.	.	.	.	.	.	+	.	.	+	.	.	+	+	+	+	+	.	.	+	+	.	.	.	+
„ lativentris Boh.	+	.	+	.	.	.	+	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	+
„ major Costa.	.	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	+	.	.	+	+
„ boops Schiödte.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.
„ flavomarginatus Stz.	.	+	+	+	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	+
„ limbatus Dahl.	+	+	+	+	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	+
„ lineatus Dahl.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.
„ ferus L.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	+	.	.	+	.	+	.	+	+
„ rugosus L.	.	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+
„ ericetorum Schltz.	+	+	.	+	+	.	+	.	.	+	+	.	.	.	+	+	.	.	.	.	+	.	.	.	.	+
„ brevis Scholtz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Hebrus pusillus Fall.	.	+	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, ruficeps Thoms.	+	.	+	+	+	.	+	+	.	+	.	+	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.
Mesovelia furcata M. & R.	.	.	+	.	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aëpophilus bonnairei Sign.	.	.	.	.	.	.	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Hydrometra stagnorum L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Microvelia reticulata Bur.	.	.	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Velia currens F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Gerris rufoscutellatus Ltr.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, paludum F.	.	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+
,, najas De G.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	+	+	.	.	+
,, costae H. S.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
,, thoracicus Schum.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	.	.	+	+
,, asper Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, gibbifer Schum.	.	.	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	.	.	.	+	.	.	+	.
,, lacustris L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, argentatus Schum.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
,, odontogaster Zett.	+	.	+	+	+	+	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	+
Ploiar. vagabunda L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, culiciformis De G.	.	.	+	.	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, baerensprungi Dhr.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pygolampis bidentata Göz.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Reduvius personatus L.	.	.	+	+	+	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Coranus subapterus De G.	.	.	+	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	+	+	.
Prostemma guttula F.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Nabis apterus F.	+	+	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, lativentris Boh.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	+	.	+
,, major Costa.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	.
,, boops Schiödte.	.	.	.	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, flavomarginatus Stz.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, limbatus Dahl.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
,, lineatus Dahl.	.	.	+	+	+	+	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
,, ferus L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, rugosus L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, ericetorum Schltz.	.	.	+	+	+	+	+	+	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	+	.	+	+
,, brevis Scholtz.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Salda pilosa Fall.	.	+	+	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
,, littoralis L.	+	+	.	.	+	+	+	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
,, oculata Müll.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, morio Zett.	+	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, marginalis Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, riparia Fall.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, scotica Curt.	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, orthochila Fieb.	+	+	+	.	+	+	+	.	+	.	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	.	.
,, saltatoria L.	+	+	+	.	+	+	+	.	+	.	+	.	.	+	+	+	+	.	.	.	+	+	+	.	+	+	.
,, C-album Fieb.	+	+	+	.	+	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.
,, opacula Zett.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, setulosa Put.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, pilosella Thoms.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
,, pallipes F.	+	+	+	.	.	.	+	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, arenicola Scholtz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, lateralis Fall.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
,, cincta H. S.	+	+	+	.	+	.	+	.	+	+	+	+	.	+	+	+	+	.	.	.	+	+	+	.	+	+	.
,, cocksi Curt.	.	+	.	.	+	.	.	+	+	.	+	+	.	+	+	+	.	.	.	.	+	+	.	.	.	.	+
,, elegantula Fall.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, v. flori Dohrn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ceratoc. coleoptratus Zett.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Pachycoleus rufescens Sahl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cryptost. alienum H. S.	+	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Cimex lectularius L.	+	+	+	.	+	+	+	.	+	+	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	.
,, columbarius Jen.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
,, pipistrelli Jen.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
,, dissimilis Horv.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Oeciacus hirundinis Jen.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Salda pilosa Fall.	·	·	+	+	·	·	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ littoralis L.	·	·	+	+	·	+	·	+	·	+	·	+	+	·	·	+	·	·	·	·	·	·	+	·	·	+	+
„ oculata Müll.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+
„ morio Zett.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	?+	+
„ marginalis Fall.	·	·	·	·	+	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ riparia Fall.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	+	·
„ scotica Curt.	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	+	·	·	·	·	·	+	+	+	·	+	+
„ orthochila Fieb.	·	·	·	+	+	+	+	+	·	+	+	+	+	·	+	+	+	+	·	·	·	·	+	+	·	+	+
„ saltatoria L.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	+	·	·	·	·	+	·	·	+	+
„ C-album Fieb.	·	·	·	·	·	·	·	+	·	+	+	+	+	·	+	·	·	·	·	·	·	·	+	+	·	+	+
„ opacula Zett.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·
„ setulosa Put.	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ pilosella Thoms.	·	·	·	+	·	+	·	+	·	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ pallipes F.	·	+	+	+	·	+	·	+	·	+	·	+	+	·	·	·	·	·	·	·	·	·	+	+	·	+	+
„ arenicola Scholtz.	·	·	·	·	+	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ lateralis Fall.	·	·	+	+	·	+	·	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	+	·
„ cincta H. S.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	+	·	·	·	·	+	+
„ cocksi Curt.	·	·	+	·	+	+	+	+	·	+	·	+	·	·	·	+	·	·	·	·	·	·	+	·	·	+	·
„ elegantula Fall.	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	+	·
„ v. flori Dohrn.	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Ceratoc. coleoptratus Zett.	·	·	·	+	+	+	+	+	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	+	·	+	·
Pachycoleus rufescens Sahl.	·	·	·	·	·	·	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Cryptost. alienum H. S.	·	·	·	·	·	·	·	+	·	·	·	+	·	·	·	+	·	·	·	·	·	·	+	+	·	+	+
Cimex lectularius L.	·	+	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	+	·
„ columbarius Jen.	·	·	·	·	·	·	·	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ pipistrelli Jen.	·	·	·	·	·	+	·	·	·	+	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
„ dissimilis Horv.	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Oeciacus hirundinis Jen.	·	·	·	+	+	·	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Lyctocoris campestris F.	+	+	+	·	+	+	+	·	·	·	+	+	·	+	+	+	+	·	·	·	+	·	+	·	+	+	+
Piezost. galactinus Fieb.	+	+	+	·	+	+	+	·	·	·	·	+	·	·	·	+	·	·	·	·	+	·	·	·	+	+	+
,, cursitans Fall.	·	+	·	·	+	·	+	·	+	+	+	·	·	·	+	+	·	·	·	·	+	+	·	·	+	+	+
,, formicetorum Boh.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Temnost. pusillus H. S.	+	+	·	·	+	·	+	·	·	+	·	+	·	+	+	+	·	·	·	·	+	·	+	·	+	+	+
Elatoph. nigricornis Zett.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Anthoc. confusus Reut.	·	+	+	+	+	·	+	+	·	+	+	+	·	+	+	+	+	·	+	+	+	·	+	+	+	+	+
,, nemoralis F.	+	+	+	+	+	+	+	·	·	+	+	·	·	+	+	+	+	+	·	·	·	+	+	·	+	+	+
,, gallarum-ulmi De G.	·	+	·	·	+	·	+	·	·	+	+	+	·	·	·	·	+	·	·	·	·	·	+	·	·	+	+
,, sarothamni D. & S.	+	+	·	·	·	·	+	·	·	·	·	·	·	+	+	+	·	·	·	·	·	·	·	·	·	·	·
,, visci Doug.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	+	·	·	·	·
,, nemorum L.	+	+	+	+	+	+	+	·	·	+	+	+	·	+	+	+	+	·	·	·	+	·	+	·	+	+	+
,, limbatus Fieb.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Tetraphleps vittata Fieb.	·	+	+	·	+	·	·	·	·	·	+	+	·	+	+	+	·	·	·	·	·	·	·	·	+	+	+
Acompoc. pygmaeus Fall.	·	+	·	+	+	+	+	·	·	·	+	+	·	+	+	+	·	·	·	·	·	+	+	·	+	+	+
,, alpinus Reut.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+	·	·	·	·	·	·	+	·	·	+	·
Triphleps nigra Wolff.	·	·	·	·	+	·	·	·	·	·	+	·	·	·	+	+	·	·	·	·	+	·	+	·	+	+	+
,, majuscula Reut.	·	·	·	·	+	+	+	·	·	·	+	·	·	+	+	+	+	+	+	+	+	+	+	·	·	+	·
,, minuta L.	·	+	·	·	+	+	+	·	·	·	+	·	·	+	+	+	+	·	·	·	+	·	+	·	+	+	
Brachyst. parvicornis Costa.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·
Cardiast. fasciiventris Garb.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·
Xylocorid. brevipennis Reut.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·
Xylocoris ater Duf.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+	+	·	·	·	+	·	·	·	·	+	·
Microph. pselaphiformis Ct.	+	+	·	·	+	·	·	·	·	·	+	+	·	+	+	+	·	·	·	·	+	·	·	·	·	+	·
,, elegantula Baer.	·	·	+	·	+	+	·	·	·	·	+	·	·	+	+	+	·	·	·	·	·	·	·	·	·	+	·
Myrmed. tenella Zett.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+	+	·	·	·	·	·	·	·	·	·	·
,, distinguenda Rt.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	+	·
,, inconspicua D. & S.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·
,, coleoptrata Fall.	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	+
Stenodema calcaratum	+	+	+	+	+	+	+	·	·	·	+	+	·	+	+	+	+	·	·	·	+	+	+	·	+	+	+
,, laevigatum	·	+	·	+	+	+	+	·	·	·	+	+	·	+	+	+	+	·	·	·	+	·	+	·	+	+	+
,, holsatum F.	+	+	+	+	+	+	+	·	·	·	+	+	·	?+	·	·	·	·	·	·	·	·	+	·	+	+	+
Notostira erratica L.	+	+	·	·	+	+	+	·	·	·	+	+	·	+	+	+	+	·	·	+	·	·	·	·	+	+	+
Megalocer. linearis Fuessl.	·	·	·	·	·	·	·	·	·	·	+	·	·	+	+	+	+	·	·	·	·	·	·	·	+	+	+
Trigonotylus ruficornis Fourc.	+	+	+	·	+	+	+	·	·	+	+	+	·	+	+	+	·	·	·	·	+	·	+	·	+	+	+
,, psammaecolor	·	+	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·
Acetropis gimmerthalii Fl.	·	·	·	·	·	·	·	·	·	+	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Lyctocoris campestris F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Piezost. galactinus Fieb.	.	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, cursitans Fall.	+	+	+	.	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	+	.	+
,, formicetorum Boh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Temnost. pusillus H. S.	+	+	.	+	+	+	+	+	+	.	+	+	.	.	.	+	.	.	.	.	+	+	+	.	.	+	+
Elatoph. nigricornis Zett.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Anthoc. confusus Reut.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
,, nemoralis F.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, gallarum-ulmi De G.	+	+	.	+	+	+	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, sarothamni D. & S.	+	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, visci Doug.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, nemorum L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	+	+	+	.	+	+
,, limbatus Fieb.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tetraphleps vittata Fieb.	+	+	.	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Acompoc. pygmaeus Fall.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, alpinus Reut.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Triphleps nigra Wolff.	.	+	.	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.
,, majuscula Reut.	+	+	+	+	+	+	+	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
,, minuta L.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachyst. parvicornis Costa.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cardiast. fasciiventris Garb.	.	+	.	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Xylocorid. brevipennis Reut.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Xylocoris ater Duf.	.	.	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Microph. pselaphiformis Ct.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, elegantula Baer.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	+
Myrmed. tenella Zett.	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	+
,, distinguenda Rt.	.	+	+	+	+	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, inconspicua D. & S.	.	.	.	.	.	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, coleoptrata Fall.	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stenodema calcaratum	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, laevigatum	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
,, holsatum F.	.	.	.	.	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
Notostira erratica L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Megalocer. linearis Fuessl.	+	+	+	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Trigonotylus ruficornis Fourc.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, psammaecolor	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Acetropis gimmerthalii Fl.	.	+	.	+	+	+	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Teratocoris antennatus Bo.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, viridis D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	+?	.	.	.	.	.	.	.	.	.	.	.	.	.
,, saundersi D. & S.	.	+	.	.	+	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Leptopterna ferrugata Fall.	+	+	+	.	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, dolabrata L.	+	+	+	+	+	+	+	.	.	.	+	+	.	.	+	+	+	.	.	+	+	+	+	.	.	+	+
Lopus gothicus L.	+	+	+	.	+	.	.	.	+	.	+	.	.	.	+	.	.	.	.	.	+	.	.	.	.	+	+
,, v. superciliosus L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.
,, flavomarginatus Don.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
,, sulcatus Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pantilius tunicatus F.	+	+	.	.	+	.	+	.	.	.	+	+	.	+	+	+	.	.	.	.	+	.	+	.	+	+	+
Mirid. 4-virgatus Costa.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Phytocoris populi L.	.	+	+	.	+	+	+	.	.	.	+	+	.	.	+	+	.	.	.	.	.	+	.	.	+	+	.
,, v. distinctus D. & S.	+	+	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, tiliae F.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	+	.	+	+	+
,, longipennis Flor.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	+	+	.	.	.	+	+	.	+	+	+
,, dimidiatus Kb.	.	+	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.	.	.	+	+	.	.	.	.	.	+
,, reuteri Saund.	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	+	+	.	.	.	.	.	.	.	+	.
,, pini Kb.	.	+	+	.	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.
,, varipes Boh.	+	.	+	.	+	.	.	.	.	.	+	+	.	.	+	+	+	.	.	.	.	.	+	.	+	+	+
,, ulmi L.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	+	+	+	+	+	+
Megacoelum infusum H. S.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.
,, beckeri Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Adelphoc. lineolatus Goeze.	+	+	.	.	.	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	+	+
,, ticinensis Mey.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
,, seticornis F.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calocoris norvegicus Gmel.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	+	.	+	.	+	+	+	.	+	+	+
,, roseomaculatus	+	+	+	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	+	.	.	+	+	+
,, alpestris Mey.	+	+	+	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, fulvomaculatus	.	.	.	.	.	+	+	.	.	.	+	.	.	.	+	+	+	.	.	.	+	+	.	.	+	+	+
,, sexguttatus F.	+	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	+	.	.
,, ochromelas Gmel.	+	+	+	+	+	.	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	.
Homodemus M-flavum Göz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pycnopterna striata L.	.	+	.	.	+	.	+	.	.	.	+	.	.	+	+	+	+	+	.	.	.	+	.	.	+	+	.
Stenotus binotatus F.	.	.	.	.	.	.	+	.	.	.	+	+	+	+	+	+	+	.	.	.	.	+	+	+	+	+	+
Dichrooscytus rufipennis Fall.	.	+	.	.	+	+	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	.	+
,, valesianus Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plesiocoris rugicollis Fall.	+	+	.	+	+	+	+	.	.	+	+	.	.	+	.	+	+	.	.	.	.	+	+	.	+	.	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Teratocoris antennatus Bo.	.	.	+	+	+	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, viridis D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, saundersi D. & S.	.	.	+	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Leptopterna ferrugata Fall.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, dolabrata L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	.
Lopus gothicus L.	.	+	+	+	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, v. superciliosus L.	.	.	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, flavomarginatus Don.	.	.	+	+	.	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
,, sulcatus Fieb.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pantilius tunicatus F.	+	.	+	+	+	+	+	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Mirid. 4-virgatus Costa.	.	.	.	+	.	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Phytocoris populi L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+
,, v. distinctus D. & S.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, tiliae F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	+	.	.	+	+
,, longipennis Flor.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	+	+
,, dimidiatus Kb.	.	.	+	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
,, reuteri Saund.	.	.	+	+	+	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, pini Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, varipes Boh.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	+
,, ulmi L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
Megacoelum infusum H. S.	+	+	+	+	+	+	+	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.
,, beckeri Fieb.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Adelphoc. lineolatus Goeze.	+	.	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	.
,, ticinensis Mey.	.	.	.	.	+	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, seticornis F.	.	.	.	+	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calocoris norvegicus Gmel.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	+	+	+
,, roseomaculatus	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, alpestris Mey.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, fulvomaculatus	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	+	.	.	.	.	+	.	.	+	+
,, sexguttatus F.	+	+	.	+	+	.	+	.	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, ochromelas Gmel.	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Homodemus M-flavum Göz.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pycnopterna striata L.	+	.	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Stenotus binotatus F.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	+
Dichrooscytus rufipennis Fall.	.	.	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, valesianus Fieb.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plesiocoris rugicollis Fall.	.	.	+	+	+	+	.	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF TH

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Lygus pabulinus L.	+	+	+	+	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, contaminatus Fal.	.	+	+	.	+	.	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	+	.	.	+	+	+
,, viridis Fall.	+	+	.	.	+	+	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	+	.	+	+	+
,, limbatus Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, lucorum Mey.	+	+	.	.	+	.	+	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	+	.	+	+	+
,, spinolae Mey.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	+	.	+	.	+	+	+
,, pratensis L.	+	+	+	+	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	+	+	.	+	+	+
,, rubricatus Fall.	.	+	+	.	+	.	.	.	.	.	+	+	.	.	+	+	.	.	.	.	.	.	+	.	.	+	+
,, atomarius Mey.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, cervinus H. S.	+	+	+	+	+	.	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, viscicola Put.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.
,, pastinacae Fall.	+	.	.	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	+	.	+	+	+
,, kalmii L.	+	+	+	+	+	.	.	.	.	.	+	.	.	+	+	+	+	.	.	+	.	.	+	.	+	+	+
,, rubicundus Fal.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Camptozyg. pinastri Fal.	.	+	+	.	+	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	+	.	+	.	+
Poecilosc. unifasciatus F.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	+	.
,, palustris Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, vulneratus Pz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Polymerus nigritus Fll.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	+
Charago. gyllenhalii Fll.	.	+	.	.	+	.	+	.	.	.	+	.	.	.	+	+	+	.	.	.	.	+	.	.	+	+	+
Liocoris tripustulatus F.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	+	.	+	.	+	.	+	+	+
Camptobr. lutescens Schil.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	+
Capsus ruber L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	+	+	.	+	.	+	.	+	.	+	+	+
,, scutellaris F.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Rhopalotomus ater L.	+	+	+	.	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	+	+	+	.	.	+	+	+
Pithanus maerkeli H. S.	+	+	+	+	+	+	+	.	.	.	+	.	.	+	+	+	.	.	.	.	+	.	+	.	+	+	+
Myrmecoris gracilis Sahl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bothynotus pilosus Boh.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Monalocoris filicis L.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	.	.	.	.	+	.	+	.	+	+	+
Bryocoris pteridis Fall.	+	+	.	+	+	+	+	.	.	.	+	+	.	+	+	.	.	.	.	.	.	.	+	.	+	+	+
Allodapus rufescens Bur.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
Systell. triguttatus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
Macrolophus nubilus H. S.	.	+	+	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+
Dicyphus constrictus Boh.	.	.	.	.	+	+	.	.	.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.
,, epilobii Reut.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	.	.	.	+	.	+	+	+
,, errans Wolff.	+	.	+	+	+	.	.	.	.	.	+	.	.	.	+	+	.	+	.	.	.	.	+	.	+	+	.
,, stachydis Reut.	.	+	+	.	+	.	+	.	.	.	+	.	.	+	+	+	+	+	.	.	+	.	+	.	+	+	+
,, pallidicornis Fieb.	+	+	+	.	+	+	+	.	+	+	+	.	.	.	+	+	.	.	.	.	.	.	+	+	.	+	+
,, globulifer Fall.	+	+	+	.	+	+	.	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	.
,, annulatus Wolff.	+	.	+	.	+	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	+	.	+
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford.	Middlesex.	Essex.	Kent.	Surrey.	Sussex.	Berkshire.	Hampshire & I.W.	Wiltshire.	Dorset.	Somerset.	Devon.	Cornwall.	Flint.	Denbigh.	Carnarvon.	Anglesey.	Merioneth.	Montgomery.	Cardigan.	Radnor.	Brecknock.	Glamorgan.	Carmarthen.	Pembroke.	Scotland.	Ireland.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Lygus pabulinus L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
,, contaminatus Fal.	+	+	+	+	+	+	+	+	+	+	+	.	+	.	.	+	.	.	.	.	.	.	+	.	.	+	+
,, viridis Fall.	+	.	+	+	+	+	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, limbatus Fall.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, lucorum Mey.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	+	+	+	+	.	+	+
,, spinolae Mey.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	.
,, pratensis L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, rubricatus Fall.	+	+	.	+	+	+	+	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, atomarius Mey.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
,, cervinus H. S.	+	+	+	+	+	+	.	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, viscicola Put.	.	.	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, pastinacae Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, kalmii L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	+	.	+	+	.	+	+
,, rubicundus Fal.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Camptozyg. pinastri Fal.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
Poecilosc. unifasciatus F.	.	+	.	+	+	+	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+
,, palustris Reut.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
,, vulneratus Pz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.
Polymerus nigritus Fll.	+	+	+	+	+	.	+	.	+	.	+	+	+	.	.	.	.	.			.	.	.	.	.	+	.
Charago. gyllenhalii Fll.	.	.	.	+	+	+	.	+	+	+	+	+	.	.	.	.	.	.		.	.	.	.	.	.	+	.
Liocoris tripustulatus F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	+	+	+	.	+	+
Camptobr. lutescens Schil.	+	+	+	+	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Capsus ruber L.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
,, scutellaris F.	.	.	+	+	+	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhopalotomus ater L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	+	+	.	+	+
Pithanus maerkeli H S	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
Myrmecoris gracilis Sahl.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bothynotus pilosus Boh.	.	.	.	+	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Monalocoris filicis L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	+	+	+	.	+	+
Bryocoris pteridis Fall.	.	.	.	+	+	+	.	+	.	+	.	+	+	.	+	+	.	+	.	.	.	+	+	+	.	+	+
Allodapus rufescens Bur.	.	.	.	+	+	.	+	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	+	+
Systell. triguttatus L.	.	.	.	+	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Macrolophus nubilus H. S.	+	+	+	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.
Dicyphus constrictus Boh.	.	.	+	.	+	+	+	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	.
,, epilobii Reut.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, errans Wolff.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	.
,, stachydis Reut.	+	+	+	+	+	+	+	.	+	.	+	.	.	.	.	+	.	.	.	.	+	.	+	+	.	+	+
,, pallidicornis Fieb.	+	+	+	+	+	+	+	+	.	.	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, globulifer Fall.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	+	+	.
,, annulatus Wolff.	+	.	+	+	+	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland.	Cumberland.	Durham.	Westmorland.	Yorkshire.	Lancashire.	Cheshire.	Shropshire.	Stafford.	Derby.	Nottingham.	Leicester.	Rutland.	Lincoln.	Norfolk.	Suffolk.	Cambridge.	Huntingdon.	Bedford.	Northampton.	Warwick.	Worcester.	Hereford.	Monmouth.	Gloucester.	Oxford.	Buckingham.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Campylon. virgula H. S.	.	+	.	.	.	.	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
Orthoceph. saltator Hahn.	.	+	+	.	.	+	+	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+	.
,, mutabilis Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
Strongyl. leucocephalus L.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.
,, luridus Fall.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Halticus luteicollis Pz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	+	.
,, saltator Geoff.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, apterus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.
Piloph. cinnamopterus Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, clavatus L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.
,, perplexus D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.
Cyllocoris histrionicus L.	+	+	.	+	+	+	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	+
,, flavonotatus Boh.	.	+	.	+	+	.	+	+	.	.	+	.	.	+	+	+	+	.	.	.	+	.	.	.	+	.	.
Aetorhinus angulatus Fall.	+	+	+	+	+	+	+	.	+	+	+	+	.	+	+	+	+	.	.	.	+	.	+	+	+	+	+
Globiceps cruciatus Reut.	+	.	+	.	+	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
,, flavomaculatus F.	.	.	+	.	+	+	+	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, dispar Boh.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
Mecomma ambulans Fall.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
Cyrtor. caricis Fall.	+	+	+	.	+	+	+	.	.	.	+	+	.	.	+	+	.	.	.	.	+	+	+	.	+	+	+
,, pygmaeus Zett.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
,, geminus Flor.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, flaveolus Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Orthotylus fuscescens Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, bilineatus Fall.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	.	+
,, virens Fall.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, flavinervis Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	+	+	+
,, marginalis Reut.	+	+	+	+	+	.	+	.	.	+	+	+	.	+	+	+	+	.	.	.	+	+	+	.	+	+	+
,, tenellus Fall.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	.	+
,, nassatus F.	.	.	+	.	.	.	+	.	.	.	+	.	.	+	+	.	+	.	.	.	+	.	+	.	+	+	.
,, viridinervis Kb.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	+
,, prasinus Fall.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.	.
,, scotti Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	+	.	.
,, ochrotrichus Fieb.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	+	.	+	+	.
,, diaphanus Kb.	.	.	.	.	+	.	+	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	+	.	+	.	+
,, flavosparsus Sahlb.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, chloropterus Kb.	+?	+	+	.	.	.	.	.	.	.	+	+	.	.	+	+	.	.	.	.	.	.	+	.	+	.	+
,, concolor Kb.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
,, adenocarpi Perris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, rubidus Put.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, v. moncreaffi D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Campylon. virgula H. S.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	+	+	+	.	+	+
Orthoceph. saltator Hahn.	+	.	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	+	.	.	.	.	+	+	.	+	+
„ mutabilis Fall.	.	.	.	.	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Strongyl. leucocephalus L.	.	.	.	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ luridus Fall.	.	.	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Halticus luteicollis Pz.	.	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
„ saltator Geoff.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ apterus L.	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Piloph. cinnamopterus Kb.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
„ clavatus L.	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
„ perplexus D. & S.	.	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Cyllocoris histrionicus L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+
„ flavonotatus Boh.	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Aetorhinus angulatus Fall.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
Globiceps cruciatus Reut.	.	.	.	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+
„ flavomaculatus F.	.	.	+	+	+	+	.	.	+	+	+	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+
„ dispar Boh.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+	+
Mecomma ambulans Fall.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
Cyrtor. caricis Fall.	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
„ pygmaeus Zett.	+	+	.	+	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
„ geminus Flor.	+	.	.	.	?+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ flaveolus Reut.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Orthotylus fuscescens Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ bilineatus Fall.	+	.	+	+	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ virens Fall.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ flavinervis Kb.	.	.	.	+	+	+	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ marginalis Reut.	.	.	+	+	+	+	.	+	+	+	+	?+	?+	.	.	+	.	.	.	.	.	+	+	+	.	+	+
„ tenellus Fall.	+	+	+	.	+	.	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	+	+
„ nassatus F.	+	+	+	+	+	+	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
„ viridinervis Kb.	.	.	.	+	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
„ prasinus Fall.	.	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	?+	.	.	.	+
„ scotti Reut.	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
„ ochrotrichus Fieb.	+	.	.	+	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+
„ diaphanus Kb.	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
„ flavosparsus Sahlb.	.	+	+	+	+	+	+	+	.	.	+	+	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.
„ chloropterus Kb.	.	.	+	+	+	+	+	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	+	.	.	+	+
„ concolor Kb.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ adenocarpi Perris	.	.	+	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
„ rubidus Put.	.	.	.	+	.	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ v. moncreaffi D. & S.	.	.	.	+	.	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Orthotylus ericetorum Fall.	+	+	+	.	+	.	+	.	+	+	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	+
Hypsitylus bicolor D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	.	+	+	.	.	+	+
Loxops coccinea Mey	.	.	+	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.
Heterotoma meriopterum Scop.	.	.	.	.	+	+	+	+	.	.	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
Heterocord. genistae Scop.	+	+	.	.	+	.	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+
„ tibialis Hahn.	+	+	+	+	+	.	+	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.
Malacocoris chlorizans Fall.	+	+	+	.	+	.	+	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	+	+
Onychum. decolor Fall.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	+	.	.	+	+
Oncot. viridiflavus Goeze.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Conostethus salinus Sahl.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
„ brevis Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ roseus Fall.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.
Hoplomach. thunbergi Fall.	.	.	.	.	.	.	.	.	.	?+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.
Megalocol. pilosus Schr.	.	.	+	.	+	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	+	+	+	+	.
„ molliculus Fall.	+	.	+	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+
Tiniceph. hortulanus Mey.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.
Amblytylus delicatus Perr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ brevicollis Fieb.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
„ affinis Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	+
Macrotyl. solitarius Mey.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.
„ paykulli Fall.	+	+	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	+	.	+	+	+
Harpocera thoracica Fall.	+	+	+	+	+	.	+	.	.	.	+	+	.	+	+	+	+	+	.	.	+	.	.	.	+	+	.
Byrsoptera rufifrons Fall.	.	.	.	.	+	.	.	+	.	.	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	+	+
Brachyarth. limitatum Fieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Phylus palliceps Fieb.	+	+	.	+	+	+	+	.	.	.	+	.	.	+	+	+	.	.	.	.	.	+	.	.	+	+	.
„ melanocephalus L.	+	+	+	+	.	.	+	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	+
„ coryli L.	.	+	.	.	.	.	+	.	.	+	+	+	.	+	+	+	.	+	.	.	+	.	.	.	+	+	.
„ v. avellanae Mey.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	+	.	.	.	+	+	.
Plesiodema pinetellum Zett.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Orthotylus ericetorum Fall.	+	+	+	+	+	+	+	+	+	.	+	+	+	.	.	+	.	.	.	.	.	.	+	.	.	+	+
Hypsitylus bicolor D. & S.	+	+	+	+	+	+	+	+	+	+	.	+	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.
Loxops coccinea Mey	+	+	+	+	+	+	+	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Heterotoma meriopterum Scop.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	+
Heterocord. genistae Scop.	.	.	.	+	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.
,, tibialis Hahn.	.	.	+	+	+	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Malacocoris chlorizans Fall.	+	+	+	+	+	+	.	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
Onychum. decolor Fall.	+	.	+	+	+	+	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Oncot. viridiflavus Goeze.	+	.	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Conostethus salinus Sahl.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, brevis Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, roseus Fall.	+	.	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hoplomach. thunbergi Fall.	.	.	+	+	+	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Megalocol. pilosus Schr.	.	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
,, molliculus Fall.	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Tiniceph. hortulanus Mey.	+	.	+	+	+	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Amblytylus delicatus Perr.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, brevicollis Fieb.	.	.	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, affinis Fieb.	+	.	+	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Macrotyl. solitarius Mey.	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, paykulli Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	+
Harpocera thoracica Fall.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
Byrsoptera rufifrons Fall.	+	+	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Brachyarth. limitatum Fieb.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phylus palliceps Fieb.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, melanocephalus L.	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, coryli L.	.	.	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	.	.	+	.	+	.	+	+
,, v. avellanae Mey.	+	.	+	+	+	+	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	.	+	+
Plesiodema pinetellum Zett.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Psallus ambiguus Fall.	+	+	+	.	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	.	.	+	.	.	+	+	+
,, betuleti Fall.	+	+	+	+	+	+	+	.	.	.	+	+	.	.	+	+	.	.	.	.	+	+	.	.	+	.	.
,, obscurellus Fall.	+	+	.	.	.	+	.	.	.	.	+	.	.	+	+	+	+	.	.	.	.	.	+	.	+	+	+
,, variabilis Fall.	+	+	+	+	+	.	+	.	.	+	+	+	.	+	+	+	+	.	.	.	.	.	.	.	+	+	+
,, v. whitei D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. simillimus D. & S.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
,, quercus Kb.	.	+	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	?+	.	.	+	.	.
,, lepidus Fieb.	+	+	+	.	+	.	+	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	+	.
,, v. minor	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	+	.	.
,, alnicola D. & S.	.	+	.	.	+	.	.	.	.	.	+	+	.	.	+	+	+	.	.	.	.	.	+	.	+	.	.
,, fallenii Reut.	+	+	+	.	+	+	.	.	.	.	+	+	.	+	+	+	+	.	.	.	+	.	+	+	+	+	.
,, luridus Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, varians H. S.	+	+	+	+	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	+	+	.	.	.	+	+	+
,, diminutus Kb.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
,, albicinctus Kb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, roseus F.	+	+	+	.	+	+	+	.	.	+	+	.	.	+	+	+	.	.	.	.	.	.	+	+	+	+	+
,, vitellinus Scholtz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
,, salicellus Mey.	.	.	.	.	+	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	+	.	+	+	+
Atractot. mali Mey.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	+	+	+	.	.	+	.	+	.	.	.	+	+
,, magnicornis Fal.	.	+	.	.	+	.	.	.	.	+	+	.	.	+	+	+	+	.	.	.	.	.	+	.	.	+	+
Plagiog. albipennis Fall.	.	+	+	.	+	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.
,, chrysanthemi Wolff.	+	+	+	+	+	+	+	.	.	+	+	+	.	+	+	+	+	.	.	+	+	.	+	.	+	+	+
,, arbustorum F.	+	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	+	+	.	.	+	.	+	.	+	+	+
Chlamyd. pullus Reut.	+	.	.	.	.	+	+	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
,, saltitans Fall.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	+	+	.	.
,, wilkinsoni D. & S.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
,, evanescens Boh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Neocoris bohemani Fall.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. scotti Fieb.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sthenarus roseri H. S.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, rottermundi Slz.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	+	+	.	.	.	.	.	.	.	+	+	+
Asciodema obsoletum Fie.	+	+	+	.	+	.	.	.	.	+	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	.	+
,, fieberi D. & S.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.
Nepa cinerea L.	+	+	+	+	+	+	+	.	+	+	+	+	.	+	+	+	+	.	.	.	+	.	+	.	+	+	.
Ranatra linearis L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	+	+	.
Apheloc. montandoni Horv.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	+	+	.	.	.	+	.
Naucoris cimicoides L.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	+	+	.	.	.	.	.	.	+	.	+	+	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford. 28	Middlesex. 29	Essex. 30	Kent. 31	Surrey. 32	Sussex. 33	Berkshire. 34	Hampshire & I.W. 35	Wiltshire. 36	Dorset. 37	Somerset. 38	Devon. 39	Cornwall. 40	Flint. 41	Denbigh. 42	Carnarvon. 43	Anglesey. 44	Merioneth. 45	Montgomery. 46	Cardigan. 47	Radnor. 48	Brecknock. 49	Glamorgan. 50	Carmarthen. 51	Pembroke. 52	Scotland. 53	Ireland. 54
Psallus ambiguus Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	+	+
,, betuleti Fall.	.	.	+	+	+	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	+	+	.	.	+	+
,, obscurellus Fall.	.	.	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, variabilis Fall.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, v. whitei D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, v. simillimus D. & S.	+	.	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, quercus Kb.	.	.	+	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
,, lepidus Fieb.	+	+	+	+	+	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	+	+
,, v. minor	+	+	.	.	.	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.
,, alnicola D. & S.	+	.	.	+	+	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+
,, fallenii Reut.	+	+	+	+	+	+	.	+	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	.	.	+	+
,, luridus Reut.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, varians H. S.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	.	.	+	+
,, diminutus Kb.	+	+	+	.	+	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+
,, albicinctus Kb.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, roseus F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, vitellinus Scholtz.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
,, salicellus Mey.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Atractot. mali Mey.	+	+	+	+	+	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, magnicornis Fal.	+	+	.	+	+	+	+	.	+	+	+	+	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.
Plagiog. albipennis Fall.	.	.	+	+	+	+	.	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	.	.
,, chrysanthemi Wolff.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, arbustorum F.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	+	.	+	+	.	+	+
Chlamyd. pullus Reut.	.	.	.	+	+	+	+	.	+	.	+	+	.	.	.	.	.	+	.	.	.	.	+	+	.	+	.
,, saltitans Fall.	.	+	.	+	+	+	.	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	+	.	+	.
,, wilkinsoni D. & S.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.
,, evanescens Boh.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Neocoris bohemani Fall.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, v. scotti Fieb.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Sthenarus roseri H. S.	.	+	.	+	+	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, rottermundi Slz.	+	.	+	+	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Asciodema obsoletum Fie.	+	+	+	+	+	+	.	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
,, fieberi D. & S.	+	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Nepa cinerea L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	.	+	+	.	+	+
Ranatra linearis L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Apheloc. montandoni Horv.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Naucoris cimicoides L.	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

DISTRIBUTION OF THE

Name of Species.	Northumberland. 1	Cumberland. 2	Durham. 3	Westmorland. 4	Yorkshire. 5	Lancashire. 6	Cheshire. 7	Shropshire. 8	Stafford. 9	Derby. 10	Nottingham. 11	Leicester. 12	Rutland. 13	Lincoln. 14	Norfolk. 15	Suffolk. 16	Cambridge. 17	Huntingdon. 18	Bedford. 19	Northampton. 20	Warwick. 21	Worcester. 22	Hereford. 23	Monmouth. 24	Gloucester. 25	Oxford. 26	Buckingham. 27
Notonecta glauca L.	+	+	+	.	+	+	+	.	+	+	+	+	+	+	+	+	+	.	+	.	+	+	+	.	+	+	+
,, furcata F.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	.
,, maculata F.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	+	.	.	.	+	.	.
,, halophila Ed.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Plea minutissima F.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	+	.
Corixa geoffroyi Leach.	+	+	+	.	+	+	+	.	+	.	+	+	+	+	+	+	+	.	.	+	+	.	+	.	+	.	+
,, panzeri Fieb.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, affinis Leach.	?+	.	.	.	.	.	.	.	?+	.	?+	.	.	?+	?+	?+	.	.	.	.	.	.	.	.	.	.	.
,, lugubris Fieb.	.	+	+	.	+	+	+	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.	.
,, selecta Fieb.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
,, hieroglyphica Duf.	+	+	.	.	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, sahlbergi Fieb.	+	+	+	.	+	+	.	.	+	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	.	+
,, linnaei Fieb.	+	+	.	.	+	+	.	.	+	+	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	.	.
,, limitata Fieb.	.	+	.	.	.	+	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	+	.	+	.	.
,, semistriata Fieb.	+	+	.	.	+	+	+	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	+	.	.	.	.
,, venusta D. & S.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
,, striata L.	+	+	+	.	+	+	+	.	.	+	+	.	+	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, distincta Fieb.	+	+	.	.	.	+	.	+	.	.	+	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
,, fallenii Fieb.	+	+	.	.	+	+	+	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+	.	+	+	+
,, moesta Fieb.	+	+	.	.	+	+	+	.	.	+	.	.	.	+	+	+	+	.	.	.	+	+	+	.	+	+	.
,, fossarum Leach.	+	+	+	.	+	+	+	.	+	.	.	.	.	+	+	+	+	.	.	.	+	.	.	.	+	.	.
,, saundersi Kirk.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, scotti Scott.	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, nigrolineata Fieb.	+	+	+	.	+	+	+	.	.	+	+	.	.	+	+	+	+	.	.	.	+	+	+	.	+	.	+
,, boldi D. & S.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, praeusta Fieb.	+	+	.	.	+	+	+	.	.	.	.	.	.	+	+	+	.	.	.	.	+	.	.	.	+	.	.
,, v. wollastoni D. & S.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, sodalis D. & S.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, caledonica Kirk.	.	?+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, concinna Fieb.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
,, carinata Sahlb.	.	.	.	+	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
,, germari Fieb.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, cavifrons Thoms.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
,, bonsdorffi Sahl.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.
,, coleoptrata F.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	+	+	+	.	.	.	.	.	.	.	+	.	.
Micron. minutissima L.	.	+	.	.	+	.	.	+	+	.	.	.	.	+	+	.	+	.	.	.	+	+	.	.	.	+	.
,, v. poweri D. & S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
,, meridionalis Cost.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

BRITISH HEMIPTERA-HETEROPTERA

Name of Species.	Hertford.	Middlesex.	Essex.	Kent.	Surrey.	Sussex.	Berkshire.	Hampshire & I.W.	Wiltshire.	Dorset.	Somerset.	Devon.	Cornwall.	Flint.	Denbigh.	Carnarvon.	Anglesey.	Merioneth.	Montgomery.	Cardigan.	Radnor.	Brecknock.	Glamorgan.	Carmarthen.	Pembroke.	Scotland.	Ireland.
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Notonecta glauca L.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	?+	·	+	+	·	+	+
,, furcata F.	·	+	+	·	+	+	·	+	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	+	·
,, maculata F.	·	+	+	·	+	·	·	+	·	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+
,, halophila Ed.	·	·	·	+	·	+	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Plea minutissima F.	+	·	+	+	+	+	·	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	·	+
Corixa geoffroyi Leach.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	·	·	·	·	·	·	·	+	+	·	+	+
,, panzeri Fieb.	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·
,, affinis Leach.	·	·	·	+	·	+	·	+	·	?+	?+	?+	?+	·	·	·	·	·	·	·	·	·	·	·	·	?+	?+
,, lugubris Fieb.	·	·	+	+	+	+	·	·	·	+	+	+	+	·	·	+	·	+	·	·	·	·	+	·	·	+	·
,, selecta Fieb.	·	·	·	+	·	+	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, hieroglyphica Duf.	+	·	+	+	+	+	·	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	+	·	·	+	·
,, sahlbergi Fieb.	+	+	+	+	+	+	+	+	·	+	+	+	+	·	·	·	·	+	·	·	?+	·	+	·	·	+	+
,, linnaei Fieb.	·	·	+	+	+	+	+	+	·	·	+	·	·	·	·	+	·	·	·	·	·	·	+	·	·	+	+
,, limitata Fieb.	·	·	+	+	+	+	+	+	·	+	·	+	·	·	·	·	·	+	·	·	·	·	+	·	·	·	·
,, semistriata Fieb.	·	·	+	+	·	+	·	+	·	·	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	+	+
,, venusta D. & S.	·	·	·	·	+	+	·	+	·	·	·	+	+	·	·	·	·	+	·	·	·	·	+	+	·	+	+
,, striata L.	+	+	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	·	·	+	+	·	+	+
,, distincta Fieb.	·	+	+	+	+	+	+	+	·	+	+	+	+	·	·	+	·	·	·	·	·	·	+	·	·	+	+
,, fallenii Fieb.	+	+	+	+	+	+	·	+	·	+	+	+	+	·	·	·	·	·	·	·	·	·	+	+	·	+	+
,, moesta Fieb.	·	·	+	+	+	+	+	+	+	+	+	+	+	·	·	+	·	·	·	·	+	·	·	·	·	+	+
,, fossarum Leach.	+	+	+	·	+	+	·	+	·	+	+	+	+	·	·	+	·	+	·	·	·	·	+	·	·	+	+
,, saundersi Kirk.	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, scotti Scott.	·	·	·	·	·	·	·	+	·	+	·	+	+	·	·	+	·	·	·	·	·	·	·	·	·	+	+
,, nigrolineata Fieb.	+	+	+	+	+	+	·	+	+	+	+	+	+	·	·	+	·	·	·	·	+	·	+	·	·	+	+
,, boldi D. & S.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, praeusta Fieb.	+	+	+	+	+	·	·	+	·	·	·	·	·	·	·	+	·	·	·	·	·	·	+	·	·	+	+
,, v. wollastoni D. & S.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	+	+
,, sodalis D. & S.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, caledonica Kirk.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·
,, concinna Fieb.	·	·	+	+	+	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	+	·
,, carinata Sahlb.	·	·	·	·	+	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	+	?+
,, germari Fieb.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+
,, cavifrons Thoms.	·	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·
,, bonsdorffi Sahl.	·	·	+	·	+	·	·	+	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	+	+
,, coleoptrata F.	·	·	+	+	+	+	·	+	·	·	+	+	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·
Micron. minutissima L.	·	+	+	·	+	+	·	+	·	+	·	+	+	·	·	+	·	·	·	·	·	·	·	·	·	+	*+
,, v. poweri D. & S.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
,, meridionalis Cost.	·	·	+	·	+	+	·	+	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54

INDEX OF PLANTS

The numbers refer to the species of Hemiptera as numbered in this work. Names of plants which are not British are printed in italics, and those that are known in Britain only in the cultivated state are marked with an asterisk.

RANUNCULACEAE.

Clematis, 31
Clematis erecta, 13
Ranunculus (crowfoot or buttercup), 5, 6, 286
,, (aquatic species), 13
,, aquatilis, 432
Eranthis lugernalis (winter aconite), 299
Nigella sativa, 69
Aconitum lycoctonum, 326
,, *septentrionale*, 286, 308

BERBERIDACEAE.

Berberis (barberry), 268

NYMPHAEACEAE.

Nuphar (yellow water-lily), 164
Nymphaea (white water-lily), 164

PAPAVERACEAE.

Papaver rheas (red poppy), 282, 417

CRUCIFERAE.

Cruciferae, 28
Cheiranthus cheiri (wallflower), 28
Koniga maritima (Alyssum), 8
Hesperis (dame's violet), 22
Sisymbrium sophia (flixweed), 27
*Brassica oleracea (cabbage), 28, 187
,, campestris v. napus (rape), 28
,, arvensis (charlock), 234
Thlaspi arvense (penny cress), 219, 234
Crambe maritima (sea kale), 282
Cakile maritima (sea rocket), 31
Raphanus raphanistrum (wild radish), 299

RESEDACEAE.

*Reseda odorata (mignonette), 42

CISTACEAE.

*Cistus, 78
Helianthemum vulgare (rock rose), 5, 336, 386

VIOLACEAE.

Violet, 6
Viola canina (dog violet), 14

CARYOPHYLLACEAE.

Pinks, 28
Dianthus, 331
,, deltoides (maiden pink), 204
Silene, 331
,, maritima (sea campion), 113
,, inflata (bladder campion), 71, 241
Melandryum pratense, 326, 331
Lychnis dioica (red campion), 326, 331
,, vespertina (white campion), 331
,, rubra, 331
Lychnis, 329
Cerastium (mouse-ear), 283
Arenaria (sandwort), 79, 370
,, maritima, 380

TAMARICACEAE.

Tamarix gallica (tamarisk), 25, 101, 304

HYPERICACEAE.

Hypericum, 56, 153, 426
,, hirsutum (hairy St. John's wort), 278, 389
,, perforatum (St. John's wort), 12, 15
,, elodes (bog St. John's wort), 3

MALVACEAE.

Althaea officinalis (marsh mallow), 302
* ,, rosea, 339
Lavatera arborea (tree mallow), 22, 135, 282
,, *trimestris*, 283
Malva, 267
,, sylvestris (common mallow), 135, 188

SIMARUBEAE.

Ailanthus, 23

RUTACEAE.

**Citrus vulgaris* (orange), 103

TILIACEAE.

Tilia (lime), 23, 34, 135, 227, 246, 247, 270, 271, 272, 302, 343, 364, 377, 402
,, parvifolia (=ulmifolia, small-leaved lime), 295, 360

GERANIACEAE.

Geranium robertianum (herb Robert), 328
Erodium, 8, 15, 32, 44, 45, 53, 57, 61, 71, 83, 87, 93, 114, 184
,, cicutarium (hemlock stork's-bill), 1, 4, 328, 418

AMPELIDACEAE.

*Vitis vinifera (vine), 108

AQUIFOLIACEAE.

Ilex aquifolium (holly), 179, 272, 333

CELASTRACEAE.

Evonymus europaeus (spindle tree), 23
Rhamnus frangula (berry-bearing alder), 43, 295, 407
  ,, catharticus (buckthorn), 31

ACERACEAE.

Sycamore, 246, 247, 270
Platanus, 272
Acer campestre (maple), 34, 270, 271, 272, 289, 343, 346, 395, 402, 407
  ,, *dasycarpum*, 31

SAPINDACEAE.

*Horse chestnut, 111

LEGUMINOSAE.

Leguminosae, 279
Genista, 25, 29, 49, 153, 376
  ,, anglica (petty whin), 375
  ,, tinctoria (dyer's green weed), 44, 375
  ,, *ovata*, 375
Ulex (furze), 22, 30, 49, 76, 83, 146, 179, 239, 241, 299, 321, 368
  ,, europaeus (furze, gorse), 25, 372, 426
  ,, nanus, 49, 239
Cytisus scoparius (Sarothamnus, Spartium, broom), 22, 29, 32, 38, 39, 44, 49, 65, 145, 146, 147, 153, 232, 266, 276, 289, 316, 335, 340, 350, 367, 368, 369, 372, 375, 376, 426
Spartium junceum, 179
Ononis (rest harrow), 6, 22, 40, 49, 53, 61, 68, 193, 265, 279, 282, 283, 332, 334, 335, 340, 364, 365, 383, 385, 386, 390, 391, 418
  ,, arvensis, 261, 391
  ,, spinosa, 390, 391
  ,, *campestris*, 331
  ,, *natrix*, 325, 391
Medicago sativa (lucerne), 49, 83, 282, 288
  ,, lupulina (black medick), 1
Melilotus officinalis (melilot), 25, 307
Trifolium (clover), 19, 25, 49, 127, 279, 283, 334, 338
  ,, arvense (hare's-foot trefoil), 382
  ,, repens (Dutch clover), 242
  ,, *montanum*, 382
Anthyllis vulneraria (lady's fingers), 241, 267, 383
Coronilla, 82
Ornithopus, 281
  ,, perpusillus (bird's foot), 419
Glycirrhiza (liquorice), 33
Onobrychis viciaefolia (sativa, sainfoin), 302
Vicia cracca (tufted vetch), 334, 336, 340
  ,, sativa (vetch), 279, 282, 416
*Vicia faba (broad bean), 127

ROSACEAE.

Prunus, 29, 227, 277, 289, 315, 402
  ,, padus (bird cherry), 34, 155, 285, 306, 314
  ,, avium (gean), 343
  ,, cerasus (cherry), 6, 148, 271
  ,, domestica (wild plum), 155, 268, 272, 273, 314
  ,, spinosa (sloe, blackthorn), 22, 24, 155, 247, 265, 285, 302, 346
*Plum trees, 363
Spiraea, 57, 281
  ,, salicifolia (willow-leaved Spiraea), 277, 295, 298, 394
  ,, ulmaria (meadow-sweet), 293, 297, 298, 308, 317, 416, 417
Rubus, 267, 273, 277, 281, 285, 302, 305
  ,, idaeus (raspberry), 6, 23, 31, 37, 41, 191, 262, 265, 282, 284, 293, 315, 326
  ,, fruticosus (bramble), 9, 22, 23, 29, 37, 40, 67, 234, 276, 298, 315, 316, 325, 384, 407
*Amygdalus (almond), 343
*Peach (Amygdalus persica), 24
Geum, 22
  ,, urbanum (wood avens), 21, 179
Fragaria vesca (strawberry), 6, 19, 22, 33, 299
Potentilla argentea (hoary cinquefoil), 283
Rose, 270, 343, 396
Wild rose, 266, 285
Rosa arvensis (trailing rose), 308
  ,, canina (rose), 19, 33, 37, 315
Pyrus, 346, 359
*Apple, 154, 179, 247, 270, 271, 274, 285, 292, 358, 377, 399, 413
Pyrus malus (crab), 29, 227, 289, 343, 356, 358
*Pyrus communis (pear), 245, 270, 271, 274, 293
Sorbus aucuparia (mountain ash), 26, 30, 34, 134, 191, 227, 270, 295, 302, 356
Sorbus fennica, 289, 295
Crataegus oxyacantha (hawthorn, whitethorn), 8, 22, 25, 26, 31, 34, 37, 38, 111, 155, 186, 227, 243, 244, 246, 249, 265, 271, 272, 277, 289, 302, 305, 314, 333, 392, 399, 402, 413

SAXIFRAGACEAE.

Ribes, 26, 187, 281
  ,, grossularia (gooseberry), 37, 41, 277, 299
  ,, nigrum (black currant), 29, 277, 285, 342, 358
  ,, rubrum (red currant), 37, 276, 277, 285, 289, 299, 342
*Philadelphus coronarius (syringa), 62, 377

CRASSULACEAE.

Sedum (stonecrop), 15, 76, 93, 421
  ,, acre (biting yellow stonecrop), 91, 145
Sempervivum (houseleek), 421

Haloragaceae.

Hippuris vulgaris (marestail), 225
Myriophyllum (water milfoil), 444, 460
Callitriche (water starwort), 432

Epilobiaceae.

Epilobium (willow herb), 20, 265, 328
,, angustifolium, (rosebay willow herb), 3, 29, 30, 293
,, hirsutum (hairy willow herb), 204, 327
Circaea lutetiana (enchanter's nightshade), 67, 329

Cucurbitaceae.

Bryonia alba (white bryony), 288

Umbelliferae.

Umbelliferae, 17, 20, 21, 22, 23, 27, 41, 54, 69, 83, 113, 127, 196, 252, 256, 267, 277, 279, 281, 282, 283, 286, 287, 295, 304, 305, 308, 313, 324, 348, 417
Eryngium, 279, 283
,, campestre (field eryngo), 241
,, *amethystinum*, 21
Astrantia, 248, 286
Conium maculatum (hemlock), 286, 304, 305, 402
Apium graveolens (wild celery), 28
Cicuta virosa (cowbane), 286
Pimpinella major (large burnet saxifrage), 234
,, saxifraga (small burnet saxifrage) 28, 57
Choerophyllum, 392
,, temulum (rough chervil), 304
Athamas, 304
Seseli hippomarthrum, 69
Foeniculum vulgare (fennel), 234
Angelica sylvestris (angelica), 26, 83, 240, 304
Peucedanum, 417
,, sativum (pastinaca, wild parsnip, 304, 417
Anethum graveolens (Dill), 304
Heracleum sphondylium (hogweed), 117, 266, 287, 315, 317, 397
Daucus carota (wild carrot), 33, 234, 282

Araliaceae.

Hedera helix (ivy), 148, 179

Cornaceae.

Cornus sanguinea (dogwood), 374

Caprifoliaceae.

Sambucus nigra (elder), 179
Viburnum lantana (wayfaring tree), 21
Linnaea borealis, 67
Lonicera (honeysuckle), 17, 25, 338, 346
,, caprifolium, 333
,, xylosteum, 37, 289, 302, 406
,, *etrusca*, 333
,, *sempervirens*, 333

Rubiaceae.

Galium (bedstraw), 265, 276, 281, 283, 308, 310, 336, 337, 383
,, boreale (northern bedstraw), 311
,, mollugo (great hedge bedstraw), 308, 310
,, erectum (upright bedstraw), 336
,, palustre (marsh bedstraw), 309
,, verum (lady's bedstraw), 14, 308, 309, 310, 311, 312, 336, 340
,, aparine (cleavers), 311
,, ochroleucum, 14, 308, 338

Valerianaceae.

Centranthus ruber (red valerian), 23

Dipsacaceae.

Dipsacaceae, 313
Scabiosa (scabious), 41, 69, 76, 283, 312
,, columbaria (small scabious), 302

Compositae.

Compositae, 17, 264, 276, 288, 299, 313
Eupatorium cannabinum (hemp agrimony), 283, 297, 374
Solidago virgaurea (golden rod), 193
Aster, 99
,, tripolium (sea aster), 76, 136, 234
Filago (cudweed), 44
Gnaphalium arenarium, 93
,, germanicum, 387
Inula viscosa, 60
,, *graveolens*, 325, 332
Pulicaria dysenterica (flea-bane), 97, 234, 294
Xanthium strumarium, 308
Bidens (bur-marigold), 164
Achillea, 71, 239, 265, 310, 314
,, millefolium (yarrow), 22, 234, 283, 299, 308, 310, 384, 385
Anthemis (chamomile), 277, 310, 328
,, cotula (May-weed, stinking chamomile), 229, 318
Chrysanthemum, 152, 281, 282, 334, 378, 383
,, leucanthemum (ox-eye daisy), 148, 283, 290
Matricaria, 40
*Dahlia, 282, 293
Tanacetum vulgare (tansy), 53, 82, 276, 282, 283, 286, 297, 299, 308, 314, 335, 384, 385
Artemisia, 21, 33, 39, 49, 53, 71, 82, 125, 145, 239, 276, 299, 310, 314
,, absinthium (wormwood) 297, 374, 415
,, campestris, 46, 82, 91, 143, 148, 184, 297, 312, 374
,, abrotanum, 415
,, vulgaris (mugwort), 9, 282, 297, 310
,, *procera*, 297
,, *arborea*, 415
,, maritima, 5, 255, 366, 370
,, *scoparia*, 312
Tussilago farfara (coltsfoot), 40, 282

Senecio, 21, 58, 299, 314, 315, 417
,, vulgaris (groundsel), 267
,, jacobaea (ragwort), 26, 53, 64, 152, 156, 277, 282, 423
Arctium lappa (great burdock), 239, 417
Carduus (thistle), 4, 21, 22, 28, 44, 53, 69, 149, 276, 279, 298, 335, 423
,, nutans (musk thistle), 150
,, crispus (welted thistle), 234, 315
,, acanthoides (welted thistle), 150
Cirsium (Cnicus, plume thistle), 21, 149, 239, 276, 281, 299, 404
,, lanceolatum (spear thistle), 150
,, arvense (Carduus arvensis, field thistle), 234, 282
,, *oleraceum*, 30, 282
Serratula (saw-wort), 150
Centaurea, 21, 58, 69, 276, 283, 340
,, nigra (hardhead, knapweed), 3, 41, 69, 103, 379
,, scabiosa (great knapweed), 7, 32, 109, 335
Lapsana communis (nipplewort), 28
Hieracium (hawkweed), 378, 383, 418
,, pilosella (mouse-ear hawkweed), 93, 324, 383
Leontodon autumnalis (autumnal hawksbit), 299
Taraxacum vulgare (dandelion), 234
Lactuca (Lettuce), 28

CAMPANULACEAE.

Jasione montana (sheep's scabious), 93, 337
Campanula (bell-flower), 286
,, rapunculoides (creeping bell-flower), 336
,, rotundifolia (harebell), 336

VACCINIACEAE.

Vaccinium, 32
,, myrtillus (bilberry, blaeberry, whortleberry), 30, 37

ERICACEAE.

Heaths, 19, 25, 33, 49, 59, 91, 92, 100, 102, 105, 112, 142, 143, 184, 199, 201, 204, 276, 299, 302, 305, 306, 319, 324, 371, 392
Calluna vulgaris (ling, heather), 6, 11, 17, 29, 30, 32, 33, 59, 76, 77, 86, 98, 115, 117, 124, 131, 132, 189, 193, 194, 195, 216, 239, 276, 279, 299, 314, 316, 319, 323, 324, 337, 371, 419
Erica, 39, 50, 66, 77, 195, 204, 239, 290, 371
,, tetralix (cross-leaved heath), 64, 189
Ledum palustre, 55, 76, 285

PLUMBAGINACEAE.

Statice, 381
,, maritima (thrift), 79, 381
,, armeria, 148

PRIMULACEAE.

Primula vulgaris (primrose), 234

OLEACEAE.

Fraxinus elatior (ash), 148, 159, 225, 270, 273, 302, 333, 346, 359, 360, 373, 377, 397, 402, 404
Olea europaea (olive), 1

ASCLEPIADACEAE.

Asclepias vincetoxicum, 69

BORAGINACEAE.

Symphytum officinale (comfrey), 326
Myosotis palustris (forget-me-not), 157
,, *lingulata*, 157
Lithospermum officinale (gromwell), 382
,, arvense (corn gromwell), 382
Echium, 267, 310
,, *vulgare* (viper's bugloss), 12, 57, 71, 109, 339, 382
,, *scabiosum*, 15

CONVOLVULACEAE.

Convolvulus arvensis (corn bindweed), 234

SOLANACEAE.

Solanum dulcamara (bittersweet), 73
*Solanum tuberosum (potato), 28, 234, 366
*Nicotiana (tobacco), 53
Hyoscyamus niger (henbane), 22, 53, 61, 69

SCROPHULARIACEAE.

Verbascum, 12, 20, 21, 53, 60, 61, 84, 110, 121, 149, 152, 315, 416
,, thapsus (mullein), 6, 22, 146, 330
,, lychnitis (white mullein), 374
Linaria vulgaris (toadflax), 266, 276
,, spuria, 332
Antirrhinum majus (snapdragon), 299
Scrophularia (figwort), 18
,, vernalis (yellow figwort), 328
,, aquatica, 329
,, nodosa (figwort), 313
,, *canina*, 313
,, *glandulosa*, 328
Digitalis purpurea (foxglove), 286, 326, 330, 394
Paulowina rectiflora, 328
,, glutinosa, 328
Melampyrum (cow-wheat), 286

LENTIBULARIACEAE.

Utricularia (bladderwort), 444

LABIATAE.

Labiatae, 9
Mentha (mint), 3, 31, 145, 164, 216
,, hirsuta, 26, 33, 67
Lycopus (gipsywort), 164
Origanum vulgare (marjoram), 10, 30, 374, 386
Thymus serpyllum (thyme), 6, 10, 71, 90, 93, 142, 144, 145, 148, 148a, 276, 334, 382
Satureia nepeta (Calamintha nepeta, lesser calamint), 313
,, vulgaris (Clinopodium vulgare, wild basil), 18, 30, 276

Salvia (sage), 279, 282
*Salvia officinalis, 332
Salvia *glutinosa*, 29
Nepeta cataria (catmint), 109
,, hederacea (Glechoma, ground ivy), 12, 119, 152
Scutellaria (skull-cap), 55
Marrubium vulgare (horehound), 19, 150
Stachys sylvatica (hedge woundwort), 9, 18, 284, 311, 325, 328, 329, 390
,, officinalis (Betonica officinalis, wood betony), 30
Eremostachys laciniata, 18
Galeopsis tetrahit (common hemp nettle), 18
,, versicolor, 308, 338
Leonurus cardiacea (motherwort), 19
Lamium, 53, 281, 313, 315
,, album (white dead nettle), 18, 22, 234, 329
Ballota nigra (black horehound), 18, 315
Teucrium scorodonia (wood-sage), 15, 62, 66, 152
Ajuga reptans (bugle), 152

PLANTAGINACEAE.

Plantago arenaria (ramosa, plantain), 310
,, coronopus (buckshorn plantain), 79
,, *cynops*, 276

ILLECEBRACEAE.

Herniaria (rupture-wort), 15, 137, 144
,, glabra (smooth rupture-wort), 136
,, hirsuta (hairy rupture-wort), 136

CHENOPODIACEAE.

Chenopodiaceae, 125, 137, 366
Chenopodium (goosefoot), 136, 148, 239, 293
,, album (fat hen, white goosefoot), 137, 366
,, glaucum, 370
,, ficifolium, 267
*Beet, 366
*Spinacia oleracea (spinach), 313
Atriplex (orach), 136, 293
,, hastata (orach), 136
,, portulacoides (Obione portulacoides, sea purslane), 79, 80, 198, 370, 380
,, *roseum*, 308
,, *crassifolia*, 136
,, *latifolia v. salina*, 136
Salicornia (glasswort), 209, 370
,, radicans, 370
Salsola kali (saltwort), 136, 198, 370
Schoberia salsa, 136

POLYGONACEAE.

Polygonum (knotgrass), 29, 164, 299, 378
,, aviculare, 63
Persicaria orientalis, 41
Dock, 41
Rumex, 192
,, acetosa (sorrel), 39
,, acetosella (sheep's sorrel), 39
Mountain sorrel (Oxyria digyna), 324
*Rheum undulatum (rhubarb), 41

ELEAGNACEAE.

Hippophaë rhamnoides (sea buckthorn), 4, 32, 114, 230

LAURINEAE.

*Laurus nobilis (bay), 271

LORANTHACEAE.

Viscum album (mistletoe), 233, 303

SANTALACEAE.

Thesium, 33
,, *ramosum* (bastard toadflax), 10
,, *linophyllum*, 10

EUPHORBIACEAE.

Euphorbia (spurge), 49, 114, 279, 280, 282
,, helioscopia (sun spurge), 234
,, *gerardiana*, 52
,, cyparissias (cypress spurge), 50, 156
,, paralias (sea spurge), 50
Buxus sempervirens (box), 43, 230, 270, 302, 314
Mercurialis annua (annual mercury), 339
,, perennis (dog mercury), 284, 286, 329, 402, 407

ULMACEAE.

Ulmus (elm), 26, 230, 231, 242, 270, 271, 274, 277, 289, 305, 314, 343, 346, 358, 363, 364, 377
,, scabra (wych elm, =U. montana), 361, 427
,, campestris (sativa, elm), 179, 294, 362

URTICACEAE.

Humulus lupulus (hop), 229, 234, 285
Urtica cannabina, 304
,, dioica (nettle), 4, 5, 28, 44, 83, 97, 125, 130, 187, 230, 265, 277, 281, 282, 284, 285, 286, 293, 297, 298, 299, 305, 312, 313, 314, 315, 325, 326, 328, 329, 336, 348, 363, 374, 393, 417

MYRICACEAE.

Myrica gale (sweet gale), 29, 55, 84, 191, 292, 297, 298, 342

AMENTACEAE.

Betula alba (birch), 17, 20, 23, 25, 26, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 76, 134, 137, 161, 186, 191, 227, 268, 271, 272, 277, 278, 285, 287, 289, 291, 294, 316, 342, 343, 344, 346, 377, 392, 396, 400, 406, 407, 412
Betula nana (dwarf birch), 33
Alnus rotundifolia (glutinosa, alder), 24, 26, 29, 30, 31, 33, 35, 38, 76, 154, 186, 227, 230, 268, 270, 271, 285, 289, 293, 294, 295, 306, 308, 313, 314, 328, 342, 343, 346, 357, 358, 374, 377, 395, 399, 405, 407, 409, 412, 425

Alnus montana, 154
,, *incana*, 268, 270, 277, 357
Carpinus betulus (hornbeam), 31, 186, 287, 315, 333, 377
Ostrya carpinifolia, 161
Corylus avellana (hazel), 20, 23, 24, 26, 29, 31, 32, 34, 46, 179, 186, 268, 271, 272, 277, 285, 287, 289, 292, 302, 306, 314, 315, 320, 333, 342, 346, 348, 359, 361, 362, 374, 377, 392, 395, 396, 397, 404, 410, 412, 426
Quercus robur (oak), 20, 23, 25, 26, 29, 30, 31, 33, 34, 35, 43, 47, 51, 94, 107, 140, 160, 161, 179, 181, 186, 191, 205, 224, 225, 227, 229, 230, 231, 234, 240, 243, 247, 248, 263, 266, 270, 271, 272, 273, 277, 278, 287, 289, 291, 295, 302, 306, 314, 320, 333, 342, 343, 344, 345, 346, 358, 359, 360, 361, 364, 369, 374, 392, 395, 396, 398, 399, 402, 403, 407, 408, 409, 410
Castanea sativa (chestnut), 26, 343
,, vesca, 271
Fagus sylvatica (beech), 23, 26, 31, 34, 35, 67, 158, 224, 225, 227, 230, 272, 285, 287, 305, 314, 333, 396, 402, 407, 409
*Walnut, 133

SALICACEAE.

Salix (sallow, willow), 24, 25, 26, 29, 33, 77, 83, 118, 127, 161, 227, 235, 270, 271, 273, 277, 280, 291, 292, 293, 294, 302, 305, 306, 313, 314, 315, 342, 343, 346, 347, 348, 357, 358, 360, 365, 371, 377, 392, 395, 399, 405, 406, 407, 409, 410, 412, 422, 423, 424
Salix purpurea, 360
,, lambertiana, 360
,, capraea, 30, 31, 34, 230, 270, 287, 289, 298, 333
,, aurita, 289, 296
,, cinerea, 289, 302
,, repens (dwarf sallow), 83, 114, 265, 269, 285, 292, 334, 342, 347, 358, 410, 418, 422, 423
,, nigricans, 296
,, lapponica, 423
,, pentandra (bay-leaved willow), 356a
Honey sallow, 292
Populus (poplar), 5, 23, 26, 35, 38, 225, 227, 229, 230, 266, 270, 271, 272, 273, 274, 314, 315, 333, 374, 377, 396, 407
Populus alba (white poplar), 20, 31, 356, 425
,, canescens, 425
,, tremula (aspen), 23, 30, 31, 34, 35, 137, 154, 191, 270, 342, 356, 394, 406, 407
,, nigra (black poplar), 111, 247
* ,, italica (Lombardy poplar), 223
,, *balsamifera*, 270, 356
,, *pyramidalis*, 278

EMPETRACEAE.

Empetrum (crowberry), 117, 418

HYDROCHARIDACEAE.

Anacharis, 432

IRIDACEAE.

Iris pseudacorus (yellow flag), 72, 83

LILIACEAE.

*Asparagus officinalis (asparagus), 23, 28
Convallaria majalis (lily of the valley), 420
,, *verticillata*, 284
Allium ursinum, 284
,, (garlic), 282
Asphodelus ramosa, 315
*Lilium martagon (Turk's cap lily), 34
Colchicum autumnale (meadow saffron), 69

JUNCACEAE.

Juncus (rush), 13, 59, 75, 123, 138, 190, 192, 196, 213, 242, 259, 260, 261, 274, 276, 280, 309, 349, 350, 352, 354, 432, 462
Juncus compressus (round-fruited rush), 262, 354
,, bufonius (toad-rush), 75

TYPHACEAE.

Typha latifolia (great reed mace), 81
Sparganium (bur-reed), 164, 213

LEMNACEAE.

Lemna (duckweed), 162, 164, 432

ALISMACEAE.

Alisma (water-plantain), 164, 429, 432

NAIADACEAE.

Potamogeton (pondweed), 166, 429, 430
,, natans, 164
Zannichellia (horned pondweed), 432

CYPERACEAE.

Cyperaceae, 84
Eleocharis (club-rush), 262, 351
Scirpus maritimus, 260
Eriophorum (cotton grass), 196
,, angustifolium, 3
Schoenus albus (bog-rush), 138
Carex (sedge), 17, 72, 84, 85, 138, 141a, 196, 261, 351, 381
,, paniculata (tussock sedge), 72
,, stricta, 167
,, vesicaria, 351, 353

GRAMINACEAE.

Grass, grasses, 6, 10, 16, 17, 19, 20, 23, 29, 33, 39, 40, 45, 46, 47, 48, 50, 51, 54, 57, 59, 62, 63, 65, 66, 86, 89, 90, 95, 98, 99, 102, 105, 109, 113, 114, 123, 127, 129, 132, 137, 138, 142, 143, 145, 149, 184, 185, 189, 193, 224, 248, 250, 252, 253, 254, 255, 256, 257, 259, 263, 264, 266, 269, 276, 277, 280, 281, 286, 290, 299, 308, 310, 311, 316, 317, 318, 324, 325, 336, 337, 340, 349, 350, 378, 380, 382, 383. 387, 389, 392, 419, 420, 421
Panicum capillare (witch grass), 264
Spartina stricta (cord grass), 210

Phleum pratense (timothy grass), 264
Calamagrostis (small reed), 59, 262
,, epigea, 78
,, arenaria, 78
Ammophila arenaria (Psamma, marram), 50, 54, 57, 60, 102, 114, 258, 260, 317
Aira caespitosa (tufted hair grass), 75, 102
Phragmites (arundo, reed), 66, 78, 127, 188, 198, 213, 260, 262
Dactylis glomerata (cock's foot), 264
Poa annua (annual meadow grass), 253, 417
,, nemoralis, 55
Glyceria distans, pulvinata, 380
Festuca (fescue), 96
,, elatior (meadow fescue), 264
,, pratensis, 47
Brachypodium sylvaticum (false brome), 256
Lolium perenne (rye grass), 256
Elymus arenarius (sea-lyme grass), 78, 258
Wheat, 21
Cereals, 28
Straw, 127, 223, 224

PINACEAE.

Juniperus (juniper), 22, 29, 33, 35, 46, 50, 53, 61, 62, 65, 66, 76, 82, 90, 92, 116, 117, 137, 186, 246, 248, 276, 277, 278, 280, 291a, 307, 333, 392
Juniperus *sabina* (savine), 24
,, communis (juniper), 10, 15, 20, 24, 33, 105, 275, 291, 401
,, *subrotundatus*, 24
Taxus baccata (yew), 38, 43, 179
Coniferae, 36, 47, 53, 76, 84, 112, 117, 134, 145, 286, 294, 300, 301, 302, 305, 306, 307, 320, 341, 374, 401, 411, 414
Firs, 23, 31, 35, 48, 109, 133, 158, 159, 161, 234, 243, 245, 248, 249, 278, 302, 312, 325
Pinus (pine), 20, 25, 38, 39, 58, 61, 82, 108, 115, 120, 159, 181, 225, 227, 229, 235, 243, 246, 247, 273, 286, 332
*Pinus pinaster(Bournemouth pine),278, 332
,, sylvestris (Scotch fir), 9, 24, 29, 134, 150, 179, 186, 228, 236, 237, 248, 249, 275, 276, 277, 278, 291, 299, 300, 304, 307, 315, 320, 341, 342, 355, 398, 401, 407, 411, 414
,, domestica, 30
,, strobus (Weymouth pine), 236, 237, 301
,, *montana* (mountain pine), 238, 300
,, *austriaca* (Austrian pine), 150, 275, 307
,, *pumilio* (dwarf pine), 238
,, *cembra* (Siberian stone pine), 238
,, *maritima* (Taurian pine), 278
,, *halepensis* (Aleppo pine), 398
Apollo fir, 26
*Abies (spruce fir), 38, 237, 238, 243, 249,299, 341
* ,, excelsa (Picea excelsa), 58, 72, 76, 77, 122, 133, 134, 179, 236, 237, 238, 248, 249, 275, 284, 291, 294, 299, 300, 301, 320, 341, 398, 399, 411, 414
,, *nigra* (black spruce), 341
* ,, pectinata (silver fir), 275, 301, 302,411
,, *alba* (white spruce), 275, 300, 302, 414
,, *sibirica*, 237, 238
* ,, douglasi, 133
Larix europaea (larch), 17, 31, 36, 38, 134, 181, 227, 236, 237, 238, 249, 275, 299, 300, 307, 315, 398, 406a, 411, 414
,, *sibirica*, 273, 411

FILICINAE.

Ferns, 33, 302, 350, 378
Pteris aquilina (bracken), 32, 254, 314, 321, 322, 325, 331
Asplenium (spleenwort), 321, 322
Athyrium filix-femina (lady fern), 286, 321, 322, 331, 350
Aspidium (shield fern), 293
Polystichum, 321, 322
Dryopteris filix-mas (male fern), 322
,, dilatata (Lastraea), 321, 322
Polypodium dryopteris (oak fern), 350
Osmunda regalis (royal fern), 16

FUNGI.

Boleti, 223

LICHENES.

Lichens, 155, 227, 229, 247, 248, 249, 271
Peltidea canina (dog-lichen), 11, 12

MUSCI.

Moss, 1, 6, 10, 33, 39, 46, 47, 53, 61, 62, 63, 65, 75, 82, 84, 86, 90, 91, 95, 99, 100, 102, 105, 109, 118, 120, 122, 123, 124, 125, 129, 132, 137, 139, 140, 141, 141a, 143, 144, 145, 146, 148, 150, 152, 153, 159, 216, 217, 248, 250, 261, 299, 305, 333, 420
Hypnum splendens, 217
Sphagnum (bog moss), 30, 85, 122, 123, 162, 163, 167, 213, 214, 215

ALGAE.

Seaweed, 210, 240, 241
Fucus, 104, 127, 165, 198
Confervae, 461

CHARACEAE.

Chara, 164

INDEX

Names of species begin with a small letter, all others with a capital.

abietis, 190
abutilon, 109
Acalypta, 201
Acanthia, 289
Acanthiidae, 288
Acanthosoma, 76
Acanthosomina, 76
Acetropis, 364
Acompocoris, 335
Acompus, 162
acuminata, 40
acuteangulatus, 95
Adelphocoris, 392
adenocarpi, 490
Aelia, 40
aeneus, 45
Aēpophilina, 230
Aēpophilus, 230
aestivalis, 553
Aetorhinus, 474
affinis (Amblytylus), 505
affinis (Corixa), 574
affinis (Scolopostethus), 187
agilis, 104
albicinctus, 525
albipennis, 529
albipes, 107
alboacuminatus, 172
albomarginatus, 36
alienum, 308
Allodapus, 452
alnicola, 521
alpestris, 399
alpinus, 336
Alydina, 100
Alydus, 100
ambiguus, 514
Amblytylus, 505
ambulans, 477
americana, 238
ampliata, 209
Aneurus, 220
angulatus, 474
angustata, 212
angustulus, 158
annulatus, 461
antennatus (Rhyparochromus) 153
antennatus (Teratocoris), 365
Anthocorina, 322
Anthocoris, 328
Aphanina, 151
Aphanus, 171
Aphelochirus, 553
apterus (Halticus), 468
apterus (Nabis), 269
apterus (Pyrrhocoris), 192
Aptus, 269
Aradidae, 216
Aradus, 216
arbustoram, 532
arenarius, 169
arenicola, 300
argentatus, 254
artemisiae, 150
Artheneina, 149
Asciodema, 539
Asopidina, 66
asper, 251
ater (Globiceps), 476
ater (Rhopalotomus), 444
ater (Xylocoris), 341
aterrimus, 219
atomarius, 422
Atractotomus, 527
avellanae, 512
avenius, 222

baccarum, 49
baerensprungi, 259
Bathysolen, 98
beckeri, 391
Belostomatidae, 541
Beosus, 174
Berytidae, 121
Berytina, 121
Berytus, 123
betulae, 219
betuleti, 516
Bibliography, 603
bicolor (Hypsitylus), 492
bicolor (Sehirus), 30
bicuspis, 334
bidens, 66
bidentata, 260
biguttatus, 34
bilineatus, 482
binotatus, 409
bipunctatus, 396
Blissina, 146
bohemani, 537
boldi, 594
boops, 277
bonnairei, 230
bonsdorffi, 599
Bothynotina, 448
Bothynotus, 448
Brachyarthrum, 510
Brachysteles, 339
Brachytropis, 352
brevicollis, 505
brevipennis (Plinthisus), 161
brevipennis (Xylocoridea), 340
brevis (Conostethus), 500
brevis (Nabis), 287
brunnea, 201
brunneus, 181
Bryocorina, 449
Bryocoris, 450
Byrsoptera, 509

caerulea, 73
c-album, 295
calcaratus (Alydus), 100
calcaratus (Miris), 352
caledonica, 595
Callicorixa, 570
Calocoris, 396
Calyptonotus, 171
campestris, 323
Camptobrochis, 439
Camptozygum, 430
Campyloneura, 462
Campylostira, 200
capitata, 197
Capsaria, 377
Capsidae, 345
Capsus, 440
capucina, 208
Cardiastethus, 339
cardui, 210
caricis, 479
carinata, 597
Carpocoris, 47
Catoplatus, 212
cavifrons, 598
Ceraleptus, 98
Ceratocombina, 304
Ceratocombus, 305
cervina, 202
cervinus, 423
Charagochilus, 436
Chartoscirta, 301
Chilacis, 149
Chiloxanthus, 289
Chinch Bug, 146
chiragra, 156
Chlamydatus, 534
chlorizans, 496
Chlorochroa, 54
chloropterus, 489
Chorosoma, 118
chrysanthemi, 530
ciliata, 212
Cimex, 310
Cimicidae, 304
Cimicina, 309
cimicoides, 556
cincta, 301
cinerea, 544
cinnamopterus, 469
clavatus, 471
claviculus, 143
clavipes, 123
coccinea, 493
cocksi, 302
coleoptrata (Corixa), 600
coleoptrata (Myrmedobia), 344
coleoptratus, 305
columbarius, 319
concinna, 596
concolor, 490
confusus (Anthocoris), 328
confusus (Drymus), 178
Conostethus, 499
constrictus, 454
contaminatus, 413
contractus, 184
Coranus, 265

Coreidae, 86
Coreina, 87
Coreus, 99
Corixa, 570
Corixidae, 564
Corizina, 108
Corizus, 109
corticalis, 216
coryli, 512
costae, 249
County Distribution, 642
crassicornis, 109
crassipes, 130
Cremnocephalaria, 451
cruciatus, 475
Cryptocerata, 541
Cryptostemma, 308
culiciformis, 258
currens, 240
cursitans (Piezostethus), 325
cursitans (Sciocoris), 39
Cydnina, 27
Cydnus, 29
Cyllocoris, 473
Cymatia, 570
Cymina, 140
Cymus, 140
Cyphostethus, 85
Cyrtorrhinus, 479

dalmani, 87
decolor, 498
decoratus, 189
delicatus, 505
denticulatus, 99
depressus, 217
Deraeocoris, 440
Derephysia, 208
diaphanus, 488
Dichrooscytus, 410
Dictyonota, 205
Dicyphus, 454
dilatatus, 155
dimidiatus, 385
diminutus, 524
Dipsocoridae, 304
Dipsocoris, 308
dispar (Globiceps), 476
dispar (Trapezonotus), 170
dissimilis, 320
distincta, 587
distinguenda, 344
distinguendus, 169
Distribution, County, 642
Distribution, Seasonal, 628
dolabrata, 371
Dolichonabis, 279
Dolycoris, 49
dominulus, 63
dorsalis, 19
Drymus, 178
dubius, 33
dumetorum, 214
dumosa, 72

Elasmostethus, 80
Elatophilus, 328
elegans, 133
elegantula (Microphysa), 342
elegantula (Salda), 303
Emblethis, 175
Emesina, 257
enervis, 161
Enoplops, 89
epilobii, 455
equestris, 137
Eremocoris, 176
ericetorum (Nabis), 286
ericetorum (Orthotylus), 491
errans, 456
erratica, 360
Eurydema, 63
Eurygaster, 21
Eusarcoris, 44
evanescens, 536

fabricii, 212
fallenii (Corixa), 587
fallenii (Psallus), 522
fallenii (Pseudophloeus), 96
fasciiventris, 339
fenestratus, 177
ferrugata, 369
ferrugatus, 84
ferrugineus, 191
ferus, 282
fieberi, 540
filicis, 449
flaveolus, 481
flavicornis, 29
flavinervis, 484
flavipes, 326
flavomaculatus, 475
flavomarginatus (Lopus), 376
flavomarginatus (Nabis), 278
flavonotatus, 473
flavosparsus, 488
flori, 304
foliacea, 208
formicetorum, 326
fossarum, 590
fracticollis, 152
fuligineus, 165
fuliginosa (Dictyonota), 207
fuliginosa (Odontoscelis), 18
fulvomaculatus, 399
furcata (Mesovelia), 225
furcata (Notonecta), 559
fuscescens, 482
fuscispina, 47

galactinus, 324
gallarum-ulmi, 330
Gastrodes, 190
geminatus, 144
geminus, 480
geniculatus, 166
genistae, 494
geoffroyi, 570
Geotomus, 30
germari, 597
Gerridae, 224
Gerridina, 244
Gerris, 246
gibbifer, 251
gimmerthali, 364
Glaenocorixa, 570
glandicolor, 140
glauca, 558
Globiceps, 475
globulifer, 460
Gnathoconus, 36
Gonocerus, 95
gothicus, 374
gracilicornis, 167
gracilis, 446
grandis, 186
Graphosomatina, 25
Graptopeltus, 171
griseus, 80
guttula, 268
gyllenhalii, 436
Gymnocerata, 16

haemorrhoidale, 76
halophila, 559
halophilus, 148
Halosalda, 300
Halticaria, 463
Halticus, 467
hamulatus, 184
Harpocera, 508
Hebridae, 222
Hebrus, 222
Hemiptera and Plants, 9
Henestarina, 147
Henestaris, 147
Heterocordylus, 494
Heterogaster, 150
Heterogastrina, 150
Heterotoma, 493
Heterotomaria, 468
Heterotomina, 463
hieroglyphica, 580
hirundinis, 321
histrionicus, 473
holosericeus, 157
holsatus, 358
Homodemus, 406
Hoplomachus, 502
hortulanus, 504
humuli, 215
hyalinus, 114
Hydrachna, 548, 552
Hydrachnidae, 542, 552
Hydrometra, 234
Hydrometridae, 224
Hydrometrina, 234
Hygrotrechus, 246
hyoscyami, 108
Hypsitylus, 492

inconspicua, 344
Index of Plants, 670
infusum, 390
interstinctum, 78
inuncta, 25
Ischnocoris, 158
Ischnodemus, 146
Ischnorhynchus, 143

Jalla, 72
juniperina, 54

kalmii, 426

lacustris, 252
laeta, 200
laevigatus, 355
laevis, 221
Lasiacantha, 208
Lasiosomus, 161
Lasiotropis, 212
lateralis (Gerris), 249
lateralis (Salda), 300
laticeps, 147
lativentris, 271
latus, 178
lawsoni, 218
lectularius, 310
lepidus, 520
Leptopterna, 369

leucocephalus, 465
limbatus (Anthocoris), 334
limbatus (Lygus), 415
limbatus (Nabis), 279
limbatus (Notochilus), 183
limitata, 582
limitatum, 510
Limnoporus, 246
linearis (Megaloceraea), 362
linearis (Ranatra), 548
lineatus (Nabis), 281
lineatus (Nysius), 137
lineolatus, 392
linnaei, 582
Liocoris, 437
List of species, 620
littoralis, 289
lituratus, 55
lividus, 98
longicornis, 362
longipennis, 384
Lopus, 374
Loxops, 493
lucorum, 416
luctuosus, 35
lugubris, 577
lurida, 153
luridus (Psallus), 523
luridus (Strongylocoris), 466
luridus (Troilus), 70
luteicollis, 467
lutescens, 439
Lyctocoris, 323
Lygaeidae, 135
Lygaeina, 136
Lygaeus, 137
Lygus, 413
lynceus, 171

Macrocorixa, 570
Macrodema, 159
Macrolopharia, 454
Macrolophina, 451
Marcolophus, 454
macrophthalma, 203
Macrotylus, 506
maculata (Notonecta), 559
maculata (Piesma), 197
maculatus, 110
maerkeli, 445
magnicornis, 528
major, 276
majuscula, 337
Malacocoris, 496
mali, 527
marginalis (Orthotylus), 484
marginalis (Salda), 292
marginata, 203
marginatus, 91
maritimus, 174
maura, 21
Mecomma, 477
medius, 106
Megacoelum, 390
Magaloceraea, 360
Megalocoleus, 502
melanocephalus (Cymus), 142
melanocephalus (Eusarcoris), 44
melanocephalus (Phylus), 512
meridionalis, 602
meriopterum, 493
Mesovelia, 225
Mesoveliina, 224
Metacanthina, 131
Metacanthus, 133
Metatropis, 131
m-flavum, 406
Micracanthia, 292
Micronecta, 601
Microphysa, 341
Microphysina, 341
micropterum, 159
Microvelia, 238
minor (Berytus), 127
minor (Psallus), 520
minuta, 338
minutissima (Micronecta), 601
minutissima (Plea), 563
Miraria, 352
Miridae, 345
Miridius, 380
miriformis, 115
Mirina, 351
Miris, 352
moesta, 588
molliculus, 503
Monalocoris, 449
Monanthia, 215
moncreaffi, 491
montandoni, 553
montivagus, 129
morio, 291
mülleri, 291
mutabilis, 465
Myodochidae, 135
Myrmecoris, 446
Myrmedobia, 343
Myrmus, 115

Nabidina, 267
Nabis, 269
najas, 248
nassatus, 486
Naucoridae, 552
Naucoris, 556
Neides, 122
nemoralis, 329
nemorum, 332
Neocoris, 537
Neottiglossa, 42
Nepa, 544
Nepidae, 542
nigra, 336
nigricornis, 328
nigrina, 203
nigritulus, 536
nigritus, 435
nigrocucullata, 24
nigrolineata, 592
norvegicus, 396
Notochilus, 183
Notonecta, 558
Notonectidae, 557
Notostira, 360
nubilus (Bathysolen), 98
nubilus (Macrolophus), 454
nubilus (Peritrechus), 168
Nysius, 137

obliquus, 141
obscurellus, 517
obsoletum, 539
ochromelas, 405
ochrotrichus, 488
oculata, 291
odontogaster, 255
Odontoscelis, 18
Oeciacus, 321
oleraceum, 64
Oligomery of Antennae, 32
Oncochila, 214
Oncotylus, 499
Onychumenus, 498
opacula, 297
Oreinocorixa, 570
Orthocephalus, 464
orthochila, 293
Orthotylus, 482

pabulinus, 413
Pachycoleus, 306
palliceps, 511
pallidicornis, 459
pallipes, 298
Palomena, 51
paludum, 246
palustris, 433
Pamera, 152
Pantilius, 379
panzeri, 575
parumpunctatus, 112
parvicornis, 339
parvula, 204
pastinacae, 425
paykulli, 507
pedestris, 164
Pelegonidae, 541
pellucens, 292
Pentatoma, 60
Pentatomidae, 16
Pentatomina, 38
Peribalus, 46
Peritrechus, 166
perplexus, 472
personatus, 261
Phylaria, 497
Phylina, 497
Phylus, 511
Physatochila, 213
Phytocoris, 381
piceus, 182
picipes, 37
Picromerus, 66
pictus, 185
Piesma, 196
Piesmina, 196
Piezodorus, 55
Piezostethus, 324
pilicornis, 180
pilipes, 178
Pilophorus, 469
pilosa, 289
pilosella, 298
pilosus (Bothynotus), 448
pilosus (Megalocoleus), 502
pinastri, 430
pinetellum, 513
pini (Aphanus), 173
pini (Phytocoris), 387
Pionosomus, 160
pipistrelli, 320
Pithanus, 445
Plagiognathus, 529
Plants and Hemiptera, 9
Plants, Index of, 670
platychila, 203
Plea, 563
plebeius, 176
Plesiocoris, 411
Plesiodema, 513
Plinthisus, 161
Ploiariola, 257

podagricus, 176
Podops, 25
Poeciloscytus, 431
Polymerus, 435
populi, 381
praetextatus, 155
praeusta, 594
prasina, 51
prasinus, 487
pratensis, 418
Prostemma, 268
Psallus, 514
psammaecolor, 364
pselaphiformis, 341
Pseudophloeus, 96
pteridis, 450
Pterygo-dimorphism, 6
puberulus, 190
pulicarius, 534
pullus, 534
punctatus, 69
punctulatus, 30
pusilla, 42
pusillus (Hebrus), 222
pusillus (Temnostethus), 327
Pycnopterna, 407
pygmaea, 238
pygmaeus (Acompocoris), 335
pygmaeus (Cyrtorrhinus), 480
Pygolampis, 260
Pyrrhocoridae, 192
Pyrrhocoris, 192

quadrata (Piesma), 196
quadrata (Verlusia), 94
quadratus, 172
quadridentata, 549
quadrimaculata, 213
quadrivirgatus, 380
quercus, 519

Ranatra, 548
Reduviidae, 255
Reduviina, 260
Reduviolus, 278
Reduvius, 261
resedae, 143
Restheniaria, 374
reticulata (Lasiotropis), 212
reticulata (Microvelia), 238
reuteri, 386
Rhacognathus, 69
Rhopalotomus, 444
Rhyparochromus, 153
riparia, 292
rivulorum, 242
rolandri, 171
roseomaculatus, 398
roseri, 537
roseus (Conostethus), 501
roseus (Psallus), 525
rottermundi, 538
ruber, 440
rubicundus, 428
rubidus, 490
rubricatus, 421
rufescens (Allodapus), 452
rufescens (Metatropis), 131
rufescens (Pachycoleus), 306
ruficeps, 223
ruficornis, 363
rufifrons, 509
rufipennis, 410
rufipes (Acompus), 162
rufipes (Pentatoma), 60
rufoscutellatus, 246
rufus, 112
rugicollis, 411
rugosus, 284
rusticus, 163
ryei, 180

sabuleti, 146
sabulicola, 157
sahlbergi, 581
Salda, 289
Saldidae, 288
salicellus, 527
salinus, 499
saltator (Halticus), 467
saltator (Orthocephalus), 464
saltatoria, 294
saltitans, 534
sanguineus, 525
sarothamni, 331
saundersi (Corixa), 590
saundersi (Teratocoris), 367
scapha, 89
scarabaeoides, 27
schillingi, 118
Sciocoris, 39
Sciodopterus, 289
Scolopostethus, 185
scotica, 293
scotti (Corixa), 591
scotti (Orthotylus), 487
scutellaris, 443
Scutellerina, 17
Seasonal Distribution, 628
Sehirus, 30
selecta, 578
semistriata, 583
Serenthia, 200
seticornis, 395
setulosa, 297
sexguttatus, 403
signoreti, 128
simillimus, 518
simplex, 214
sodalis, 595
solitarius, 506
Spathocera, 87
spinolae, 417
stachydis, 457
stagnorum, 234
Stålia, 277
Stenocephalina, 103
Stenocephalus, 104
Stenodema, 352
Stenotus, 409
Sthenarus, 537
strichnocera, 206
striata (Corixa), 584
striata (Pycnopterna), 407
Strongylocoris, 465
Stygnocoris, 163
subapterus, 265
subrufus, 111
sulcatus, 377
sylvaticus, 180
sylvestris, 168
Syromastes, 91
Systellonotus, 453

Taphropeltus, 183
Teloleuca, 292
Temnostethus, 327
tenella, 343
tenellus, 485
Teratocoris, 365
Tetraphleps, 334
Therapha, 108
thomsoni, 188
thoracica, 508
thoracicus, 250
thunbergi, 502
thymi, 138
Thyreocoris, 27
tibialis, 495
ticinensis, 394
tiliae, 382
Tingidae, 196
Tingidina, 199
Tingis, 209
tipularius, 122
Trapezonotus, 169
Trichobothria, 8
tricornis, 205
Trigonotylus, 363
triguttatus, 453
Triphleps, 336
tripustulatus, 437
tristriatus, 85
Troilus, 70
Tropistethus, 157
tunicatus, 379
typhae, 149

ullrichi, 170
ulmi, 388
unifasciatus, 431
urticae, 150

vagabunda, 257
valesianus, 411
variabilis, 518
varians, 523
varipes, 387
varius, 160
Velia, 240
Veliina, 237
venusta, 583
verbasci, 175
Verlusia, 94
verna, 200
vernalis, 46
vestita, 296
virens, 483
virgula, 462
viridiflavus, 499
viridinervis, 486
viridis (Lygus), 414
viridis (Teratocoris), 367
visci, 331
viscicola, 424
vitellinus, 526
vittata, 334
vulneratus, 434

waltlii, 97
whitei, 518
wilkinsoni, 535
wollastoni, 594

Xanthochilus, 172
Xylocoridea, 340
Xylocoris, 341

Zicrona, 73

Printed for Messrs. H. F. & G. Witherby
by William Brendon & Son, Ltd., Plymouth.

Date Due

JUN 19 1957

~~JUN 7 '[illegible]~~

6-9

MONTANA STATE UNIVERSITY - BOZEMAN
3 1762 10455122 9

595.75
B97

29523